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The Green Thumb

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SPRING, 1974



THE COVER

You Can Grow These Vegetables

Photo from Denver Botanic Gardens files

THE GREEN THUMB VOL. THIRTY-ONE, NUMBER ONE

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The Green Thumb

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WES WOODWARD—EDITOR

SPRING, 1974

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Anybody Can Grow VEGETABLES

Dave Boyle

Growing your own vegetables can be a profitable venture in more ways than one. With the cost of living continuing to spiral, all of us may soon be producing our own groceries!

There has been a tremendous increase in the number of people with back yard gardens during the last two or three years. Cost of living is not the only reason for this jump. A great deal of satisfaction and pride is derived from growing your

own produce. It is difficult to equal the taste and quality of freshly harvested vegetables. They just can't be beat!

An increasing concern of many is the additives and chemical contaminants being found in our food. By growing your own, you know what you are getting with your lettuce besides dressing.

Even if you are an apartment dweller or have a limited amount of space there are vegetables that may be grown in containers. Make use of your balcony or patio or an unused corner of your yard for your "mini-garden."

One of the most important considerations when planning a vegetable garden is the site. This includes factors such as soil, exposure, and drainage. Let us consider soil first.

If your soil will grow a crop of weeds, then you have the basic plant needs for a garden. If weeds don't even grow in the proposed area, you've got a problem. Improvement of the soil is a continuing process and one of utmost importance.

If you picked up a handful of soil you would find it contained three basic things — soil particles, air, and water. The percentage of each varies with different soils. Ideally the soil should contain about one-half soil, one-quarter air, and one-quarter water. This ratio should be what you strive for when adding anything to the soil.



Dave Boyle is C.S.U. Extension Agent (Horticulture) for Jefferson County

Heavy clay soils or poorly drained areas have a very low amount of air space. This results in poor plant growth because the roots are deprived of sufficient oxygen. These are the kinds of soils that especially need improving.

There are all kinds of material available for soil improvement. The most common and probably best are those of an organic nature. Don't rely on a chemical product to solve your soil problems.

It's more work, but physically spading or plowing organic matter such as peat moss, manure, compost and related materials into your garden area is best. This should be an annual process. As the organic matter breaks down and releases its nutrients for plant use, it needs replenishing.

This may be done in the fall or spring depending on the weather and your preferences. Simply spread the material evenly over the garden area and work it into the soil to a depth of 8 - 12 inches. Try to get a uniform mixing of soil and organic matter rather than pockets of organic matter scattered through the garden.

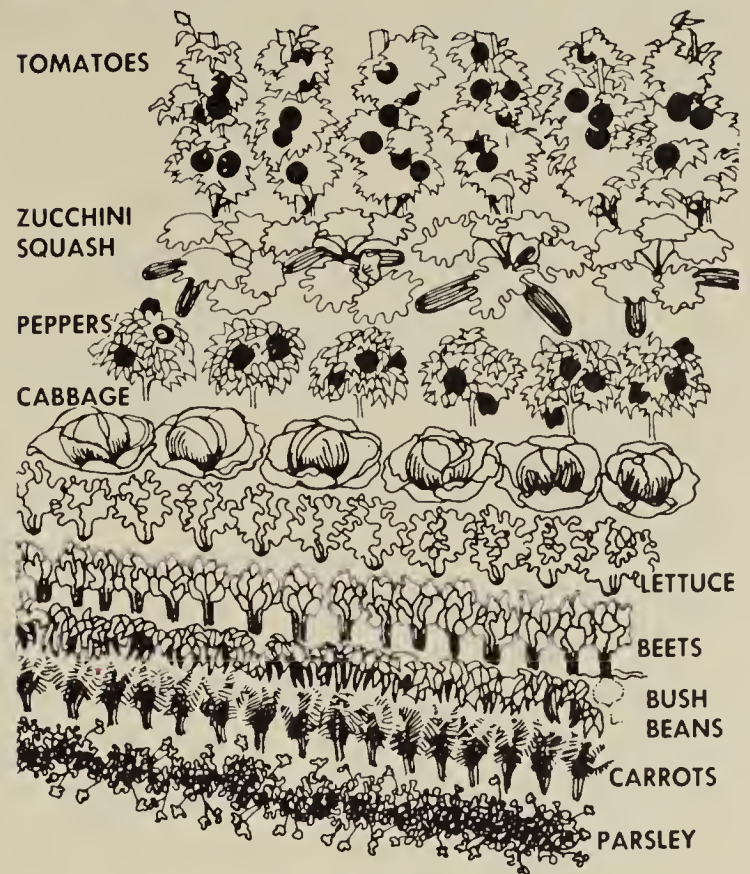
If your soil is especially bad (heavy clay or extremely sandy) as much as three cubic yards of material may be used on a 1000 square foot area. Three cubic yards spread evenly over a 1000 square foot area will be approximately one inch thick.

There are some cautions to be aware of in adding organic materials to the soil. It can be overdone. If too much is put into the soil, the result is poor plant growth. Also, if you use barnyard manures, be sure that they are aged. It should be at least six months old and preferably a year. If this precaution is not followed there may be some severe damage to your plants.

How about fertilizing? This can be overdone also — especially with high nitrogen fertilizers. Nitrogen encourages nice large green leafy growth; this is not always desirable, especially if it detracts from bean formation or carrot root.

DF-5

SAVE MONEY GROWING YOUR OWN VEGETABLES



In the vegetable garden featured above, the total seed cost is just \$3.10, capable of yielding \$100-worth of fresh vegetables. For the beginner, fertilizer and tools may be an extra expense, but clearly the potential savings are worthwhile. Time spent in the garden can be written off as healthy exercise.

If you follow a regular soil improvement program using such things as manure or compost, no other fertilization should be necessary. If needed, an application of a low nitrogen fertilizer can be put on. This would be a 5-10-5 or 6-10-4 ratio for example.

Now that we have the soil ready to go, what do we plant? Simply put, plant what you like to eat. Don't expect all vegetables or all varieties to thrive under our conditions however. We don't have what you would call a long growing season in Colorado. It varies from an average of four days long in Fraser to 188 days long in Grand Junction. The Denver area has a growing season averaging 165 days. But, don't count on that happening every year. The trend lately seems to be for much shorter growing seasons.

So, vegetables such as melons, eggplant and sweet corn that like a warm growing season may not always mature properly. Seed companies are always ex-

perimenting with vegetables in an attempt to get early maturing vegetables. These would be the kinds to try. Lists of recommended vegetable varieties are available from local county extension service offices.

Make gardening fun by trying new things each year. Experiment! After three or four years of this you will know what does best in your particular situation. Keep records on what varieties you planted, how they grew, and when they were ready to harvest. By doing this you will know what to eliminate or expand for the following year.

The care of the vegetable garden after it comes up is relatively simple. Weed, water, watch and wait. Don't overwater however, as this can drive the oxygen out

of the soil, resulting in poor plant growth. Check the soil moisture by digging down to the depths of the roots and feeling the soil. If it feels dry, water thoroughly and let the soil dry somewhat before watering again. Frequent light waterings benefit the weeds more than the vegetables.

Hoeing and pulling are the best methods of weed control in a home garden. Using chemicals for weed control is a bit risky in a garden. You may end up controlling the vegetables as well as the weeds.

Growing vegetables is relatively simple if you know the basics of plant growth. Don't hesitate because you haven't grown vegetables before. It is a very worthwhile project that is fun as well as profitable.



Happiness is a Vegetable Garden

VEGETABLES TO GROW IN YOUR HOME GARDEN

Beverly Nilsen

Vegetable gardening is a popular activity at the Denver Botanic Gardens. Children from 9 to 14 years of age have their own individual garden plots in the Children's Garden section. Each garden is 10' x 10', or 100 square feet of gardening area. Perhaps that sounds small to you but a garden of that size produces an ample crop of vegetables. This is accomplished by planning the garden carefully to make maximum use of the space, and replanting varieties as the early maturing crops are removed.

Select vegetable varieties that will mature during our growing season. Most seed packets will indicate how many days it will take for the plant to reach maturity. Remember, however, this would be under optimum conditions and maturity times will vary according to the weather conditions of that particular season. Some plants must be grown indoors (or greenhouse grown) and set out after danger of frost is past, as tomato, pepper, cabbage, cauliflower, eggplant and broccoli.

Vegetables can be roughly divided into 2 groups: (1) cool season or hardy crops and (2) warm season or tender crops. To determine which vegetables can be grown successfully it is necessary to determine the length of the growing season. In Denver the average date of the last killing frost is May 10. The frost free date for planting of tender crops would be the latter part of May.

Cool season crops should be planted in April. Included in this category are onions, peas, spinach, turnips and lettuce,



This is the way we hoe the weeds in the Children's Garden.

Mrs. Beverly M. Nilsen is Botanist-Horticulturist at Denver Botanic Gardens.

followed by beets, carrots, Swiss chard and radishes. Warm season crops that can be planted mid-to-late May include: snap beans, parsnips, okra, squash, sweet corn, tomatoes, eggplant, broccoli, cabbage, lima beans, cucumbers and cauliflower.

Each child plants a variety of vegetables. We have found the varieties listed

for each of the vegetables to be successful for our purpose. A limited list for each vegetable is included. There are other varieties which are just as good for our area and which may be more suitable for your particular need. Your local seed company can give you names of these varieties.

COOL SEASON CROPS

BEET variety: Detroit Dark Red 65 days

Beets are probably native to the eastern Mediterranean countries, but are generally grown all over the world. They have been grown in the United States since 1806. The beet is a close relative of Swiss chard, sugar beets and mangels. Beets are very hardy and a popular garden vegetable. They produce well and are of high food value. These vegetables are fairly tolerant of heat and are resistant to cold but not severe freezing. Stringy tough beets are the result of lack of moisture or competition from weeds and other beets. Beet seeds contain 2-6 kernels, therefore some thinning is necessary to prevent a tangle of roots and a poor crop of beets.

CARROT	variety:	Chantenay	72 days	6"
		Imperator #58	78 days	tapered, long
		Scarlet Nantes	68 days	6"

The carrot, as we know it today, is supposed to have originated from the wild carrot, often called Queen Ann's Lace which is one of the worst weeds we have to contend with. Carrots are fairly hardy plants and will tolerate light freezes but not severe ones. They are one of the most nutritious vegetables grown and can be eaten raw or cooked. Carrots contain carotin, a yellow pigment which is transformed by the body into vitamin A. For straight, smooth roots, carrots must have loose deep soil. Lack of thinning also will cause malformed roots.

ENDIVE	variety:	Salad King	90 days	curled
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Endive is native to the East Indies and has been grown for many years as a salad plant. It closely resembles lettuce in its requirements, except that it is less sensitive to heat. Endive responds best in temperate regions and is fairly resistant to frost. There are two types: broadleaf and curled.

KALE variety: Dwarf Green Curled

Kale, sometimes referred to as borecole, is a member of the cabbage family and is grown for its leaves. The best garden varieties are low growing, spreading plants with more or less krinkled leaves. Harvest either by cutting the entire plant or by taking the larger leaves. Only the young leaves should be used in salads, as older leaves are tough.

LETTUCE	varieties:	Grand Rapids	43 days	light green
		Prizehead	50 days	red edged

Lettuce is native to Asia. It belongs to the sunflower family and is related to the above mentioned endive. Lettuce is the most popular salad plant and can be grown



Most popular salad plant



Oldest vegetable in cultivation

in any home garden. It is a cool weather crop being as sensitive to heat as any vegetable grown. Lettuce needs lots of sunlight, cool nights and plenty of moisture. Leaf lettuce has more nutritional value than head lettuce because all of the leaves are green.

ONION varieties: White Lisbon (bunching) 60 days
 onion sets — various

Onions are native to southwest Asia, and were brought to North America in 1634. There are many species of *Allium* that do not have the oniony flavor and odor but are attractive flowering plants. Onions can be grown throughout the United States either from seeds or sets. The bunching types are best, of course, for salads. They do best with an abundance of moisture and temperate climate without extremes of heat and cold through the growing season.

PARSLEY variety: Champion Moss Curled 70 days

Parsley is an Old World herb that is grown in nearly every home garden and is extensively grown in market gardens. It produces leaves highly valued for their aromatic flavoring properties and is used as a garnish. Parsley thrives under the same temperature conditions as lettuce and spinach.

PEAS varieties: Progress #9 62 days
 Little Marvel 62 days

Peas are the oldest vegetable in cultivation, having been grown in Egypt long before the Christian era. Peas are one of the most important vegetables from the standpoint of canning, ranking next to sweet corn in importance. As a green vegetable it isn't as important as snap beans. The young plants can tolerate quite a bit of cold and also light frosts so plant early enough to let them mature before hot weather. When finished producing, remove the vines and plant another vegetable in this area. When

VEGETABLES TO GROW
IN YOUR HOME GARDEN

COOL SEASON CROPS
continued

peas are picked they should be left in the pods until they are to be used. They will stay fresh longer and chilling them tends to preserve the sugars in the seeds.

RADISH	varieties:	Cherry Belle	23 days	globe
		Early Scarlet Globe	23 days	globe
		White Icicle	27 days	long

The radish is a native of Asia and has been in cultivation many centuries. Radishes were highly prized by the pharoahs of Egypt and by the Greeks. By the 16th century, England and France had them and in the early 1800's eleven kinds of radishes were grown in America. They are one of the easiest vegetables to grow and are probably grown in more gardens than any other vegetable. They do best in cool temperatures and mature the quickest of any garden crop. However, they remain in prime condition only a few days, so to insure the best flavor plant no more than you can eat and plant at 10 day intervals.

SPINACH	variety:	Bloomsdale Dark Green (Longstanding)	45 days
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Spinach originally came from Asia and eastern Europe and is now grown in practically every corner of the world. It is one of our most important vegetables. It is attractive, grows quickly and is very productive. The leaves are high in vitamin content.

SWISS CHARD	varieties:	Lucullus	50 days
		Rhubarb (stems and midribs crimson)	60 days

Swiss chard is probably the ancestor of the common beet. The wild form is found in the Canary Islands, the Mediterranean region and east to southern Asia. It is grown for its large edible leaves. Unlike spinach which produces one crop, the outer leaves can be snipped off with shears and the supply will constantly be renewed by growth from the center. Only one planting is necessary of this easy to grow, reliable vegetable.

TURNIP	variety:	Purple Top White Globe	55 days
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The turnip is a native of northeastern Europe. Turnips and rutabagas are closely related and are among the most commonly grown and widely adapted root crops in the United States. Turnips should not be permitted to get too large; the small ones are palatable and tender but the larger they grow the more fibrous and strong they become.



WARM SEASON CROPS

BEAN	varieties:	Tendercrop	56 days	medium green
		Tendergreen Improved	56 days	dark green
		Cherokee	58 days	deep yellow
		Earli-wax	54 days	golden yellow
		Kentucky Wonder (pole)	65 days	
		Fordhook (bush lima)	75 days	

This includes green and wax beans; called snap beans and string beans. Indians in North and South America had snap and kidney beans before the Europeans arrived. Early settlers took the beans back and introduced them in Europe. Beans are one of the most popular vegetables. The bean is a legume and is able to obtain nitrogen from the air and is often used as a rotation crop for soil improvement. Their vines are plowed under to fertilize the succeeding crop. Snap beans cannot be planted until the ground is thoroughly warm. Successive plantings can be made every two weeks until about the first part of July. Lima beans, also called butter beans, are used exclusively as seeds, never as edible pods. Their origin was probably in tropical South America and are now generally grown throughout warmer sections of the United States.

BROCCOLI variety: Topper

Broccoli is probably a forerunner of cauliflower and was developed to a high degree of perfection by the Danish gardeners. It is one of the newer vegetables in American gardens. A member of the cabbage family it produces flowering buds which are a delicacy and because of the high vitamin content, even the young leaves as well as tender parts of the stem are eaten. It is easier to grow than cauliflower and can be harvested over a long period as many side shoots develop.

CABBAGE	varieties:	Improved Globe	75 days
		Golden Acre	60 days
		Red Acre or Red Hollander	90 days

Modern varieties of cabbage were developed from the wild cabbage found along the England coasts and along the southern and western coasts of Europe. It is grown in all parts of the world. As it can be grown in practically any climate that has three months of summer it is adapted to all sections of the United States. It ranks as one of the most important home garden crops and is probably the most popular member of the cabbage family, as it can be used in both the raw state or cooked and is high in mineral and vitamin content.

CAULIFLOWER variety: Snowball "E"

Cauliflower is another member of the cabbage family that is prized for its broad



white flower heads of closely packed buds. Too much warm weather keeps cauliflower from heading. When the heads are nearly full grown, the outer leaves should be pulled over the top so that the heads are shaded from the sun. This will bleach the heads to white in about three weeks.

CORN variety: Golden Cross Bantam 85 days

Corn supported the early civilization of the Americas. Following the discovery of America, corn spread rapidly through the Old World. Sweet corn is one of the five principle types of corn and it is distinguished by its translucent seeds due to their sugar content. Corn likes heat, needs full sunlight and needs plenty of moisture especially at silking time when the kernels are forming. Corn can be planted either in hills or rows.

CUCUMBER varieies: Marketer 70 days
 Sweet Slice 60 days

People grew cucumbers in western Asia more than 3,000 years ago and so did the Greeks and Romans. Cucumbers are a warm weather crop, very sensitive to frost and need to be grown in areas where summers are warm for at least ninety days. Cucumbers are used fresh cut for salads and are an important source of pickles. Special small size pickling varieties are available. This vegetable has a high water content. Lack of moisture means bitter cucumbers. They are good climbers and the vines actually grow better off of the ground where the fruit grows straight and is easy to harvest.

EGGPLANT variety: Black Beauty 80 days

Native to the tropics, the eggplant was grown for centuries in India, China and Arabia. It arrived in Europe during the Moorish invasion of Spain. It is a warm weather crop and requires a long warm growing season to mature properly. It is extremely sensitive to the conditions under which it is grown, and more susceptible to low temperature injury than tomatoes or peppers.

OKRA variety: Perkins Dwarf Green Spineless 60 days

Okra, or gumbo, is a tropical annual from the Nile Valley. It has about the same degree of hardiness as tomatoes or cucumbers. Seeds should not be sown until the soil is warm. Pick pods and use when young. No pods should be allowed to ripen their seeds or the plant will cease producing.

PARSNIP variety: All American 95 days

The parsnip is a native of Europe and of ancient cultures that is now adapted to culture over a wide portion of the United States. It requires warm soil and weather at planting time. It is a vegetable for the special palate as its flavor does not attract people generally. Although not as popular as beets and carrots, parsnips are rich in vitamins.

PEPPER varieties: California Wonder 75 days
 Yolo Wonder Improved 72 days
 Anaheim Chile (medium hot) 80 days
 Jalapeno (very hot) 75 days

Peppers originated in tropical America. There is no relation to the black pepper.

Bot. L.S. 7 K

They are hot weather plants and cannot be planted until the soil is warm. Transplant into the garden. They have basically similar growing needs as that of tomatoes and eggplant. There are two main kinds: sweet and hot.

SQUASH	varieties:	Black Zucchini	65 days black green
		Early Yellow Straightneck	46 days yellow

Squash is native to the Americas. People of North and South America were using squash for food long before Columbus arrived. They are warm season plants easily injured by frost. There are two types: bush and runner. Bush varieties are usually best for home use unless you have a large area to accommodate the ramblings of the runner types. They are prolific and one plant can probably satisfy most needs.

TOMATO	varieties:	Earliana	66 days
		Fantastic	65 days
		Spring Giant	70 days

Tomatoes are native to tropical America. Around the mid 1800's they became generally grown for food in the United States. They are sensitive to cold so never plant out until danger of frost is past. Start plants indoors to increase yield in the field. Staking has advantages for home gardeners — requires less space, cultivation is easier and fruits are clean and easy to find. Several conditions may cause bloom drop — night temperatures below 55°, hot dry winds, temperatures of 100°, rain or prolonged humid conditions.



Cabbage is grown in all parts of the world, sometimes with great success.

GROWING VEGETABLES IN THE DENVER REGION

J. E. Ells

This article is a reprint, with modifications, of parts of Bulletin 386-A, *Gardening By The Month*, published by the Colorado State University Extension Service, Fort Collins, Colorado. J. E. Ells is Extension Associate Professor (Vegetable Crops) at Colorado State University.

Kind and Size of Garden

The size of your garden should be determined by the site, space, and time available, and the needs of the family. Other factors to be considered are fertility of the soil, amount and source of irrigation water available, and abundance of sunlight. Approximately 1,000 square feet of garden are sufficient to provide all of the vegetables required by one person for one year. Small gardens will supply a surprisingly large amount of fresh vegetables. The smaller the garden the more it should produce per square foot; therefore, the soil must be more fertile, the rows and plants must be closer together and each individual plant must receive better attention. Larger gardens enable the gardener to use labor-saving devices and rows may be spaced further apart. Small gardens demand that those kinds be planted which will give the greatest yields of vitamins and minerals. Tomatoes, beans, carrots, and vegetable greens should be found in the smallest gardens. As the garden increases in size a greater variety of vegetables may be planted.

For convenience, gardens may be classified as: 1. Small kitchen gardens. 2. Large kitchen gardens. 3. Family gardens. 4. Farm gardens. In which group does your garden fall?

1. Small Garden: 100 sq. ft. to 625 sq. ft. This garden is usually found on a town or city lot and the space used may have previously been waste or in flowers or grass. Usually there is no opportunity to select the site or place. This garden gives the grower the opportunity of attaining near perfection. The soil can be heavily fertilized. Every inch of space can be utilized. Every plant can receive individual attention. Insect and disease damage can be held to a minimum and not a single weed need be allowed to grow.

The small garden should include those crops adapted to your conditions and the crops your family likes which will produce the greatest amount of vitamins per square foot: mustard greens, spinach, beets, turnips, when the tops are used; tomatoes, broccoli, carrots, cabbage, and string beans.

2. Large Kitchen Garden: 625 sq. ft. to 2,500 sq. ft. A garden of this size is still an intensive garden. Besides furnishing a plentiful supply of the more important vegetables for summer use, some products may be canned, stored or dried for winter use. Corn, potatoes, cucumbers, squash, cabbage and other similar crops may be found in this garden. Perennials such as asparagus, rhubarb, and strawberries may also be added to the crops produced if the site is permanent.

3. Family-Size Garden: 2,500 to 5,000 sq. ft. This also is an intensive garden and it is one which requires a lot of work. Results can be more than satisfying. As we approach 5,000 square feet we reach a size which will produce all of the garden vegetables and fruits required for a family of four or five. The wheel hoe and seed drill are highly desirable pieces of equipment for the family-size garden. They will save much time and labor, will do a good job, and will add greatly to the pleasure of gardening.

4. Farm Gardens: See Bulletin 386-A.

Choosing the Site

You may not have much choice as to where your garden will be located, but the following will help you to understand what conditions are needed for plants to grow well.

The land should be level or gently sloping toward the south or southeast. It should not be too steep, for then it will wash. High ground is less susceptible to frost injury. The soil should be deep; a dark, sandy loam is preferred. It is important to know that enough water is available and that it can be easily used. A minimum of 5 hours of direct sun is required each day for a successful garden. Do not attempt to grow a garden where a fill has been made of cinders or broken bricks, or where large trees shade the garden crops and steal plant moisture and food from them. Do not garden on seepy soil or where gravel or rocks are a few inches below the surface.

Planning the Garden

The garden should be planned on paper first. It is much easier to destroy a row of undesirable vegetables with an eraser than with the hoe. Do not plan to plant the entire garden all at once when the "spring urge" gives you untold ambition. Plan for an early garden, plan for a canning garden, and plan for a storage garden. Garden planting starts in March and will extend through July. A good rule to follow when starting to lay out a garden plan is: plant first things first and plant them close to the kitchen door. As the season warms up proceed across the garden with the last plantings. Care must be taken not to plant corn or pole beans where they will shade other crops.

The first garden planned for a new site can be arranged for beauty as well as a balanced production. After the first year, crops should be rotated; planning for beauty thus becomes less possible.

Causes of Garden Failures

Kind and Variety — Some kinds of vegetables are unadapted to your com-



Plant vegetables that yield vitamins

munity. If the kind is adapted there are superior varieties. There are several classifications for vegetables such as warm-season and cool-season crops, hardy crops and tender crops, long-season and short-season crops, etc. For example — tomatoes, a warm-season crop, are retarded by cold nights; head lettuce, a cool-season crop may bolt when hot weather comes; cabbage is hardy and will stand light frosts; beans are tender and will not tolerate frost. Radishes are a short-season crop and will mature where the growing seasons are short. Watermelons require a long season to mature.

Insects and Disease — There are many insects and diseases which prevent normal growth. Many of the insects are so small that they may not be noticed. The symptoms of certain diseases are sometimes baffling to the specialist. The failure to control insects and disease is a frequent cause of crop failures.

Irrigation — Too much or too little water is a common cause for failure. Vegetables vary in the amounts of water they require and in the frequency of watering. Celery, early potatoes, and onions require large amounts of water and irrigations must be frequent. Sweet corn

GROWING VEGETABLES IN THE DENVER REGION

and snap beans require small amounts of water and may be severely damaged by too much water.

Soil — The analysis of several hundred garden soils, where problems existed, has been helpful in only a few isolated cases. Soil analysis for garden soils cannot be considered practical. A Colorado soil which will grow a good crop of weeds will produce a good garden. It is easy to maintain the fertility of a garden soil. Drainage is the only answer for a poorly drained soil. Most Colorado soils will respond to relatively heavy applications of organic matter (barnyard manure, peat moss, leaf-mold, and compost). Small amounts of a complete mineral fertilizer will insure sufficient nutrients. The over application of readily available plant foods, particularly nitrogen, can be wasteful and harmful.

Other Common Causes —

Careless use of herbicides, insecticides, and fungicides.

Root pruning by cultivating too closely and too deeply.

Planting at improper depth.

Failure to control weeds.

Failure to control crusts.

Improper spacing and failure to thin.

Too much shade.

Competition from nearby trees or shrubs.

What to Plant

Varieties — Varieties of the principal vegetable crops are recommended by Colorado State University and your extension agent. These usually will do better than other varieties you might select. They may be resistant to certain diseases occurring in your locality, and their structure and adaptability may favor your growing conditions. The use of recommended varieties will generally result in bigger yields of high quality and greater uniformity.

Do not plant vegetable varieties not adapted to your community or disliked by the family. Vine crops such as melons, cucumbers, squash, and pumpkins are warm-season crops and will not do well at high altitudes where nights are cool. Peas, root crops, lettuce, cabbage, cauliflower, and spinach enjoy cool nights. Make sure your growing season (the period between the last killing frost in the spring and the first killing frost in the fall) is long enough to mature the varieties you are planting.

Start Before Spring

Growing Plants — Garden crops such as cabbage, tomatoes, pepper, cauliflower, eggplant, broccoli, celery, and head lettuce may be started inside and transplanted later.

You can produce good plants and make sure you will have the variety you want by planting the seed and raising the plants. There are many methods and combinations of methods used in plant production. Shallow flats, bands, pots, hotbeds, and cold frames and various combinations of these methods may be used to produce hardy and healthy plants. For the family garden "flats" are perhaps the most satisfactory.

A "flat" is a shallow box. A common size measures 3 or 4 inches deep by 12 by 15 inches. Drainage is provided by holes or cracks in the bottom. A good soil for the flat may be made by mixing together one-fourth sand, one-fourth well-rotted manure and one-half good garden loam. If well-rotted leafmold or compost is on hand this mixed with one-third sand is one of the best soils to use in flats. A soil too rich is undesirable; it must have organic matter to provide plant food and to hold moisture, and must be loose to allow the roots to penetrate and make it easy to work.

Firm the soil by packing lightly, then

mark into rows using a straightedge. Make the rows one-quarter inch deep and 1 or 2 inches apart. Plant the seed about 1 inch apart, barely cover, and firm the soil lightly. Sprinkle the flat carefully with lukewarm water. Keep the flat at room temperature. After the seed has germinated, place the flat in a sunny location. Water and turn the box every other day so that all the plants will get an equal amount of sunshine. Do not water too heavily. It is a good idea to cover the flat with paper after seeding and keep it covered until the seedlings break through the soil.

The first leaves to appear are not true leaves. When the young plants show their first true leaves they should be thinned carefully and those removed transplanted to another flat. Many times paper pots, paper cups, bands or berry boxes and even tin cans are prepared and placed in the second flat and the plants transplanted to these containers. Be sure the containers have drainage.

Time Required – The time required to grow plants from seed until they are ready to plant in the field is as follows:

- Onions – 10 to 12 weeks.
- Peppers – 8 to 10 weeks.
- Eggplant – 8 to 10 weeks.
- Celery – 8 to 10 weeks.
- Tomatoes – 6 to 7 weeks.
- Cauliflower – 6 to 7 weeks.
- Cabbage – 6 to 7 weeks.
- Lettuce – 4 to 7 weeks.
- Kohlrabi – 4 to 6 weeks.
- Broccoli – 4 to 6 weeks.

When to Plant

Time of Planting in Garden – Because of the great variation in seasons over the state, definite dates for field planting can not be given for Colorado. Consult with local people who know. The following dates are usually considered safe and are given as a guide as to when tender crops can safely be planted. However, seasons vary tremendously from year to year and there may be a great difference in the dates of killing frosts in the same general locality. Safe dates usually are:

- April 25 – Grand Junction
- May 1 – Pueblo
- May 5 – Canon City, Lamar, Holly, Rocky Ford.
- May 10 – Denver, Boulder, Las Animas
- May 15 – Cheyenne Wells, Burlington, Akron, Montrose, Wray, Colorado Springs, Longmont, Greeley, Sterling, Fort Collins.
- May 20 – Julesburg, Delta, Cedaredge, Holyoke
- May 25 – Limon, Calhan, Rifle
- June 1 – Grover, Glenwood Springs
- June 5 – Dolores, Durango, Monument, Collbran.
- June 10 – Salida, Alamosa, Saguache
- June 15 – Igancio, Manassa, Buena Vista
- June 20 – Meeker, Estes Park, Aspen, Hayden, Victor.

Tender plants like tomatoes, eggplant, and peppers cannot be safely planted until long after the half hardy plants, such as cabbage, lettuce, cauliflower, and celery.

A Guide to GROWING VEGETABLES IN THE DENVER REGION

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GROWING VEGETABLES IN THE DENVER REGION

GARDEN CALENDAR

(Dates are only approximate)

January and February

1. Look over seed catalogs. Decide on varieties recommended for your community. Order seeds.

2. Make or repair "flats", hotbeds and coldframes.

3. Locate organic material, compost or manure for the garden. This may be piled in small piles to be spread later and plowed under if garden has not been fall plowed.

4. Make garden plans on paper.

Planning the Garden — At this time you should decide where your garden is going to be, how big it will be, and what kinds and varieties of vegetables you will plant. How much of each kind of vegetable should be planted? The whole family should go into conference on these important questions. A good garden will provide tomatoes, leafy, green, and yellow vegetables for summer use and canning. It will provide cabbage and root crops and potatoes for winter storage, if of sufficient size.

After all details have been decided, plan your garden on paper. This planning makes it possible to arrange the space so all will be utilized. Measure the space you are going to use for your garden, then with a ruler and sharp pencil, map it out on a heavy wrapping paper. Use a scale of one-eighth or one-quarter inch for each foot. Where horse or tractor garden tools are used, run the rows the long way of the garden if it is possible to irrigate this way. The rows in a small hand-cultivated garden should run north and south if possible. Now decide what, when, and where the vegetables are to be planted and draw the rows to scale on your map.

Your first map probably will be changed several times but it is much

easier to change on paper than in the garden. When the plan which suits the family best has been decided upon, copy it very neatly and refer to it often.

March

1. Treat all seeds, where treatment is recommended, before planting. Treat by putting a pinch of the seed treatment in an envelope with the seeds then seal the envelope and shake it a few times. Pour treated seeds out on paper and separate from excess treating material before planting.

2. Seed tomato, cabbage, pepper, celery, etc. in flats in the house or in hotbeds outside. Take care of the plants.

3. If the season permits, you can prepare your soil for planting. Make a good seedbed and plant early cool-season crops such as peas, lettuce, radishes, onion sets, and spinach.

4. Study the latest information on gardening, especially on insects and disease control and order your insecticides.

Preparation of the Garden — Most garden land will be plowed this month. However, if the soil is quite heavy it would have helped if it had been plowed in the fall. Perhaps you are spading your ground. Whatever the method used to turn the soil, be sure to turn it deeply. Many successful gardeners turn the soil in the fall and again in the spring. A liberal application of organic matter, such as rotted barnyard manure, compost, leafmold or peat moss, chicken or rabbit manure, spread evenly and turned under will give excellent results. Use barnyard manure at the rate of 1 pound per square foot. Use poultry and rabbit manure at the rate of 1 pound for every 10 square feet; 100 pounds of peat moss per 1,000 square feet. Manures or compost may be supplemented with commercial fertilizer. One pound of superphosphate can be used to each 100 square

feet of garden space ($\frac{1}{4}$ pound to each bushel of barnyard manure or compost). Garden fertility can be insured by adding 1 to 2 pounds of a low-analysis complete mineral fertilizer to each 100 square feet when preparing the seedbed and after spading or plowing. Most Colorado soils are well balanced with plant food but the addition of organic matter loosens the soil and lets the air in and improves the moisture-holding capacity.

When you are plowing or spading do a neat, clean job. Keep the clods and large chunks of dirt on top. Spade or plow at least 6 inches deep, 10 inches is better, but be careful that very little new or unfertile subsoil is brought to the surface. Carefully remove chunks of sod, rocks, large roots and other rubbish.

The newly turned soil should be raked or harrowed immediately while it is still soft and full of moisture. Rake or harrow in several directions. Level and firm the seedbed until it is finely pulverized to a depth of several inches. A rake with curved teeth is better than straight teeth for pulverizing, and the back of the rake can be used to level the surface. A loose, cloddy surface will result in poor germination; a loose, cloddy subsurface will retard plant growth and will cause root crops to be poorly shaped.

April

1. Plant beets, carrots, lettuce, onions, parsnips, peas, early potatoes, radishes, spinach, and turnips this month.

2. Transplant to the garden early cabbage, cauliflower, broccoli, head lettuce, kohlrabi, and onion plants.

3. Apply cutworm bait if cutworms are present. Protect transplants with tar paper discs or paper collars.

4. Transplant or thin plants in flats or hotbeds. "Harden off" all plants, except tomatoes, by reducing water supply and temperature and by increasing ventilation. During the day covers may be lifted on hotbeds and cold frames and flats may be set outdoors. "Harden off" gradually.

Transplanting to the Garden — Plants which you have produced should be carefully transplanted. Follow these simple rules:

1. Select a cloudy day or plant in the late afternoon or evening.

2. The soil around the plants in the hotbed or flat should be well moistened before transplanting. Keep as much soil on roots as possible during moving, and do not let roots dry out.

3. Set plants slightly deeper than they were growing in flat and do not cramp roots. Large tomato plants should be set in a slanting hole with only 5 or 6 inches of the top exposed. The slanting hole prevents placing the roots too deep where the soil may be extremely cold.

4. Transplant to a moist soil if possible. Firm the soil tightly around plant roots.

5. Water each plant after it has been set. Place dry soil around plant after water has soaked in.

6. Break off one or two of the older leaves, except on cauliflower, celery and head lettuce, to reduce evaporation. If possible, shade plants from sun for 2 or 3 days.

7. A starter solution applied immediately around the plants after transplanting may increase growth and yield and will assist the plant in becoming established. Use a low-analysis complete fertilizer at the rate of $\frac{1}{2}$ pound to 5 gallons of water. Use 1 pint of this solution to each plant, taking care not to pour it on stem and leaves. Liquid manure, made by soaking solid manure in twice its volume of water, also is a good starter.

Seeding — A garden line, a yardstick, a hoe, a rake, and some small stakes to



Plant beets

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mark the ends of the rows are necessary seeding equipment.





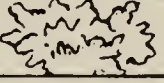
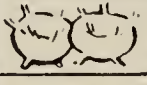
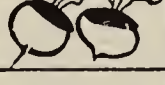
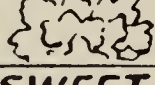

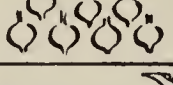


Make your garden line by attaching each end of a fairly heavy twine to two sharp-pointed sticks. Make the line as long as the length of the garden rows. When not in use keep it wound around the sticks. A pointed broom handle from a worn-out broom will make two excellent stakes.

Set your garden line parallel with one edge of the garden. Use a yardstick to measure the distance from the edge of the garden to the first row and where your line will be located. The yardstick

is also used to get the desired planting distance between rows and to keep the rows parallel.

Make the rows straight. Make the seed trenches as narrow as possible by following the garden line with the end of the hoe handle for small seeds and the corner of the blade for larger seeds. Follow your garden plans and the planting table to see what seeds to plant and the depth to plant. Do not make more than one trench at a time before planting. Cover seed immediately to prevent the soil from drying out. Press the damp soil firmly around the seed by tamping lightly with the back of the hoe or rake, then carefully spread

PLANTING DATA for VEGETABLE PLOT

VEGETABLE CROP	DAYS TO TABLE SIZE	HARVEST FROM 1 SOWING LASTS	GROW FOR 4 PORTION SERVING
BEANS, SNAP 	45-53	4 WEEKS	1 FOOT
 BEETS	55-80	6 WEEKS	1 FOOT
CARROTS 	60-80	8 WEEKS	2 FEET
 CUCUMBERS	45-75	4 WEEKS	2 FEET
ENDIVE 	70-90	6 WEEKS	1 FOOT
 KOHLRABI	60	3 WEEKS	2 FEET
TURNIPS 	40-75	2 WEEKS	1 1/2 FEET
 SPINACH	40-50	2 WEEKS	3 FEET
SWEET CORN 	65-105	10 DAYS	4 FEET
 ONION SETS	21	4 WEEKS	1 FOOT
PEAS 	60-75	2 WEEKS	3 FEET
 EARLY	25	1 WEEK	1 FOOT
SUMMER	45	2 WEEKS	1 FOOT
RADISHES WINTER	60	6 WEEKS	1 FOOT

a thin layer of fine loose soil over the row. The back of the garden rake used lightly is useful in this operation. Don't plant too deeply and don't plant in a dry soil. Remember, moist soil must surround the seed to insure germination. In all seeding operations you will find it helpful if your seedbed has been properly prepared. A moist, fine layer of earth to receive the seeds will pay well.

Radishes may be planted with slow-germinating seeds and small seeds such as carrots, onions, beets, and parsnips so that the row will appear quicker, making early cultivation possible. Using the radishes when ready for table leaves a thinned row. Mulching the row of seed with lawn clippings, well-rotted sawdust or sandy compost will also aid in germinating seeds slow to sprout. These mulches, however, may attract cutworms.

May

1. Transplant tomato, celery, eggplant, pepper, and other plants not transplanted in April. Plant beans, corn, and vine crops and make second plantings of peas.

2. Start cultivation, weeding, and thinning. Start hilling potatoes.

3. Watch for insects. Flea beetles, aphids, cabbage worms, grasshoppers, cutworms, and radish and onion maggots may appear this month. Apply control recommendations when they appear. Ten days after tomatoes are transplanted apply psyllid control as recommended. When potatoes are 4 to 6 inches tall apply psyllid control. Repeat psyllid control every 10 days to 2 weeks on tomatoes and potatoes.

Cultivation, Weeding, and Thinning —

Get an early start on weeds. Work well done this month will save a lot of work later on. Every weed that grows robs the soil of plant food and moisture.

Thinning is usually necessary. Just as soon as the plants have their third or fourth pair of true leaves developing, or as soon as they can be distinguished from weeds, they should be thinned. At thinning time all weeds in the row and for an inch or 2 on either side should be removed by pulling. In thinning, try to leave the healthy plants and discard the



Plant corn

small and weak. The following distances between plants are recommended. Leaf lettuce, chard and spinach, solid row; radishes, 1 inch; carrots, early onions, peas, early beets, and turnips, 2 inches; bush beans, late beets, late turnips, late onions, late carrots, and parsnips, 4 inches; lima beans, kohlrabi, and celery, 6 inches; head lettuce, sweet corn, potatoes, and asparagus, 12 inches; early cabbage, brussels sprouts, broccoli, eggplant, pepper, cauliflower, 16 to 18 inches; cucumbers and sweet corn in hills, 4 plants every 3 feet; muskmelon and summer squash, 4 every 4 feet; watermelon, pumpkins, and winter squash, 4 every 6 feet; tomatoes staked, 2 feet, not staked, 3 to 4 feet. Beets, turnips, and head lettuce can be thinned lightly at first and then again a few weeks later when the beets and turnips make greens which are tasty and high in vitamin content; the thinned lettuce may be used in salads. Do not expect vegetables crowded in the row to be of high quality.

The main object in cultivation is to destroy weed growth. The best cultivation is a shallow cultivation and one which results in a shallow, level layer of loose soil on the surface. This dry mulch will keep down moisture

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losses. The garden should be cultivated after each rain or irrigation and just as soon as the ground can be worked without stickiness. Cultivate regularly, at least once a week during the early part of the season. An hour of cultivation at the right time will often save hours of work later. If cultivation and weeding are done in the early morning, the hot midday sun will kill the uprooted weeds. Perennial weed roots such as wild morning glory or bindweed and poverty weed should be removed and burned.

For the small garden, the hoe and rake are satisfactory cultivating implements. As the garden increases in size, wheel hoes and hand cultivators will lighten the work. Farm gardens should always be planned for the use of horse or tractor-drawn implements. About this time of year it may become apparent that your crops are not growing as they should. If the soil has warmed up and growth is slow, you may decide to use a commercial fertilizer. A low-analysis fertilizer such as a 4-12-4 may be used by sprinkling it around the plants or down the side of each row then cultivating or raking it into the soil; a light irrigation may follow. Use the fertilizer at the rate of 2 pounds per 100 feet of row. An additional application may be made about the middle of the season, using the same amount.

June

1. Check suggestions for May. Were they all accomplished?

2. Make second planting of bush beans and sweet corn. Plant late potatoes, beets, carrots, and celery for fall storage and winter use, in late June or early July.

3. Be prepared to protect vegetable crops from insect damage. Be selfish. Do not let insects destroy the products of your well-laid plans and hard work. Watch for bean beetles; they are the most serious pest of beans in Colorado. Squash bugs, corn earworms, and Colorado potato beetles may appear this month. Continue spraying potatoes and tomatoes for



psyllids. Don't let plant lice or grasshoppers get ahead of you.

Insect and Disease Control — The crucial test for your garden comes next month. Give your garden a fair chance. Prevent insect damage. Regardless of how well the garden is cared for, insects and disease are bound to appear.

A small hand duster or spray gun and the right kind of dust or spray are effective, inexpensive, and a very good investment. If you hit the bugs early and hit them hard, there is no secret to insect control. Learn to identify the common garden insects and discover the type of injury they do. Some insects, such as aphids and squash bugs, suck plant juices. Some insects, such as flea-beetles, grasshoppers, and cabbage worms, chew holes in the stem or leaves.

Poisons applied to the leaf will not kill sucking insects. They must be hit with the poison and this means a special kind, a contact poison such as nicotine sulfate, retenone, pyrethrum or malathion. For

chewing insects, a stomach poison, sprayed or dusted on the surface of the plant, will kill the pest when it takes a bite. Some of the new insecticides such as malathion are effective against many sucking and chewing insects. Frequently a combination dust or spray which can be mixed at home or purchased will give very effective insect control. This type can be especially recommended for the small garden. Mixtures containing sulfur also have certain disease-controlling values.

Hand picking is a very successful method of insect control for bean beetles, potato beetles, squash bugs, and tomato worms. Mash the eggs found upon the plant at the same time you pick the insects off.

In the control of diseases, seed treatment, sanitation and good growing conditions are the important factors. Plants from good seed grown on clean ground and given good care may not be troubled with disease. Good garden sanitation is a continuous clean-up process of removing all weeds, sick plants, stems and other plant refuse found in and around the garden.

July

1. July is the critical month in the garden. Water thoroughly and stir the soil often enough so that it does not have a chance to crust over.

2. Never let any portion of your garden go to waste. Refer often to your garden plans. Just as soon as one vegetable is taken out sow some other vegetables in its place. Clean off and burn or compost early pea vines after harvest. Clean up all rows which are past their period of usefulness. Make your last plantings this month. Early varieties of dwarf beans, table beets, carrots, and turnips may be planted for storage.

3. Keep up insect control; how is the battle going? Watch for blister beetles, tomato hornworms, and red spiders.

4. This is a good month to start the compost pile.

5. Go on a garden tour.

Irrigation — Vegetables are composed largely of water. Water is necessary to carry plant food into the roots of the

plant. Water is necessary to keep the plant from wilting. An even supply of water in the soil is necessary for normal, profitable growth. The soil is the pantry for the growing plant, the plant's source of food and drink. Over-watering carries away plant food. In saturated soil, plants will starve or suffocate from lack of good and air.

Vegetable thirsts vary. All crops do not require the same amount of water. Quick growing and leafy vegetables, and shallow-rooted vegetables require water more often than other vegetables. Vegetables with light-green leaves will normally turn dark green when they need water and may turn light green and even yellow when they are receiving too much water. When molded soil retains its shape in your hand when you let go, the soil contains sufficient moisture. You are the only one who can tell when to irrigate. Watch your plants carefully and do not let them suffer from thirst. If you have a dryland garden, try to develop some supplemental water.

Except for sub-irrigation, the most economical use of water can be secured by running the water along the rows in shallow furrows. Don't use the hose and nozzle if you can avoid it. The only exception is when the germinating seeds need a light sprinkling to get them through the surface of the soil.



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When watering, a thorough irrigation every week or two is better than several light irrigations at shorter intervals.

Cultivate just as soon as the soil can be worked after irrigating. Fill the furrows. Do not cultivate too deeply as you may cut off roots close to the surface of the ground.

The Compost Pile — Early pea vines, lawn clippings, radishes past their usable stage, tops from root crops, weeds, and garden refuse of all kinds can be easily made into valuable plant food for use on your garden next spring. Make a compost pile; they are easy to build.

Select a space of the size desired, perhaps 4 by 6 feet for the small garden. Set firmly 4 posts about 4 feet high at the corners and if you have some unused poultry netting or other wire put it around on the inside of the posts. Throw in the refuse as it accumulates and when you have a layer 8 inches deep add 2 inches of soil. Repeat this layering process as refuse becomes available. *Do not use diseased refuse.*

Keep the pile moist through the summer and winter for best results. Wet it with the hose or throw a couple of buckets of water on it if it appears to be dry. Make it decay.

Decay can be speeded up and the compost made more valuable by mixing a bushel or 2 of poultry or rabbit manure through the pile. If manure is not available then 7 or 8 pounds of a balanced commercial fertilizer can be used for each 100 pounds of plant refuse. If manure or mixed commercial fertilizer is not available then 4 or 5 pounds of ammonium nitrate to each 100 pounds of plant refuse will give excellent results.

August

1. Watch the growing plants. Do not let them suffer from lack of water. They have just gone through the hottest month and, in

many sections of the state, the driest month of the year.

2. Continue treatments to control insects where necessary; particularly continue psyllid control on potatoes and tomatoes.

3. Dispose of the early varieties of cabbage as they mature. Do not let cucumbers ripen if you expect them to bear late in the season. Harvest the onions which have ripened.

4. Study the selection and preparation of vegetables for showing. Exhibit at your local show, and try to be present when your vegetable exhibits are judged.

Selecting Vegetables for Exhibit — Every gardener should exhibit, if possible. You will have several opportunities at local, town, or county fairs. You will be surprised and proud to see your vegetables win ribbons. The following hints should help you make a good exhibit.

The first thing to do is to read the premium list and rules carefully. Check those crops which you will have to exhibit. Never say "Mine are not good enough," or "I have better vegetables at home."

Vegetables are judged on quality and type. Quality for table use means fresh, clean, and of marketable size, with good color and proper maturity. Crispness and tenderness are essential with most crops. Too large specimens may lack quality, and may not be typical of the variety. Average-sized vegetables are best for exhibiting. Blemishes of any kind are objectionable, so make sure there is no bruise or injury caused by handling, insects, or disease.

Exhibit what the premium list calls for. If it calls for "a plate of 5 tomatoes" then don't have 6 and don't have 4, or your exhibit may not be judged. If collections are called for, use plenty of space. Show the same number of each variety as you would show as an individual entry. Arrange your collection of vegetables to obtain balance, order, and neatness. Each kind of vegetable should be neatly labeled with the name of the

variety.

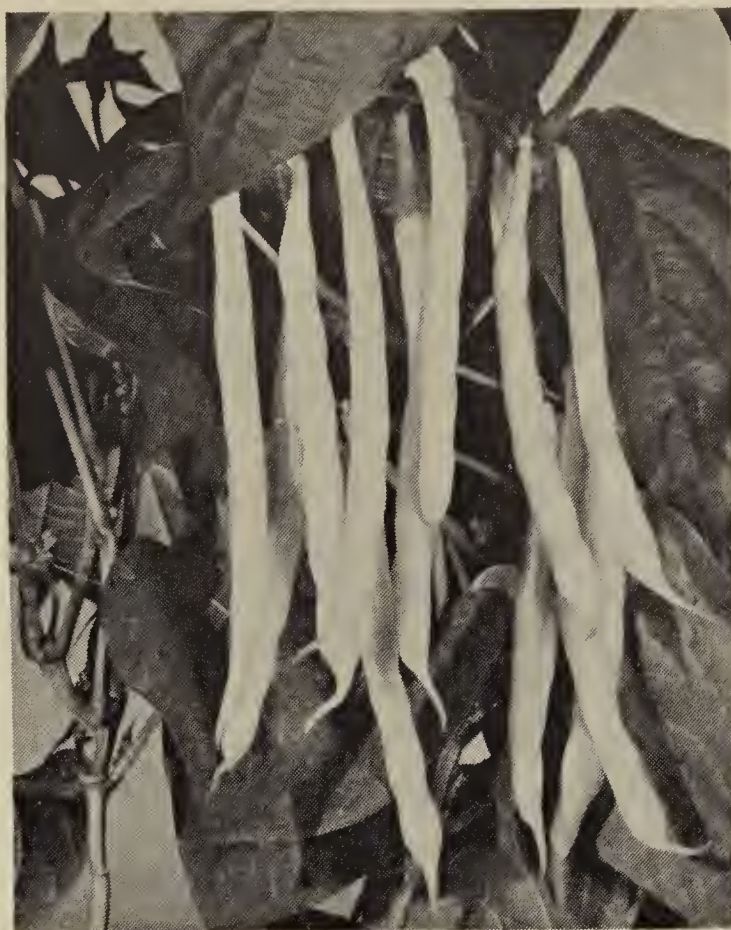
In selecting the sample, have every vegetable uniform in size, shape, color, and quality.

“If you should dig some spuds with care
And take them to the County Fair,
Be sure they are like Mike and Ike
In color, size, and shape alike.”

Root crops, if topped, should have about 1 inch of leaf stalks left on. Crowns should be small. Root crops should be washed only if necessary; a soft brush will do wonders in cleaning root crops. Potatoes should be brushed clean after the surface is dry; never wash a potato for exhibit. Stems must be left on squash, pumpkins, and melons. Tomatoes must be solid, of good color for the variety, and well ripened at the time of the exhibit. Tomatoes are usually shown with the stems on. Green tomatoes may show a slight pink blush; they should cut pink. Corn is shown with the husks on. The rows must be straight and the ear must be well filled from tip to butt with juicy, tender kernels of uniform size, shape, and color. Be sure the ears are free of worm injury. Loose wrapper skins should not be removed from onions. Cabbage heads must be solid with the stem cut off. Just enough leaves are taken off to make the heads look good; leave 2 or 3 wrapper leaves on if possible. String beans should be straight, smooth, brittle, and free of rust spots. Do not break off the stem of the bean when picking it. In all exhibits the variety shown should be true to type. Study pictures in the seed catalogs and when you make out your entry blank give the variety name.

Late the evening before or early the morning of the fair is a good time to select vegetables for showing. If vegetables are gathered the night before, place them in a protected cool place and cover with wet sacks or blankets to make them crisp. Leafy vegetables such as spinach and lettuce can be plunged in cold water to keep them fresh and crisp.

Handle your exhibits carefully and do not injure them when moving them to



Uniform in size, shape, color, quality.

the show. Many exhibitors wrap each vegetable separately in wrapping paper, and a basket is preferable to a bag or flimsy box in transporting them. Be an early bird and have your exhibit in on time. Preserve your ribbons for they will become more valuable to you each year.

September

1. Thresh and store beans (dry).
2. Harvest and store onions.
3. Fight weeds; don't let any go to seed this month.
4. Continue the compost pile. Be sure it is kept damp.

Harvesting — There is a proper time to harvest all vegetables. At this stage they will be the most palatable, usually the most nutritious, and will possess the most quality. Lessons learned in selecting for exhibition will help you judge when to harvest. For the table, for canning, for freezing and drying, the vegetables should be consumed or processed just as soon after harvest as possible. Knowing exactly when to harvest will come with experience and testing. If your garden has been carefully planned you will not have more than you can handle at one time. Most vegetables are at their best for only a

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short time. Home-produced vegetables, just a short time from the garden to the table or can, are a treat no restaurant or store can supply.

Vegetables such as peas, corn, beans, and cucumbers are at their best for only a short time. Harvest peas when the pods are about full; string beans when the pods are tender and before the bean seeds become too large. Corn which squirts with enthusiasm is ready for corn on the cob. For canning, the corn can be a little older but should still be in the milk stage. Cucumbers are prime when they are small and if you want them to keep bearing, don't let any get over ripe.

Root crops such as radishes, carrots, beets, and turnips should be harvested when small for best quality. Parsnips may be left in the ground all winter and harvested in the spring as needed. Head lettuce becomes worthless in a short time. It should be used as soon as the heads are firm and compact. Tender, crisp leaf lettuce and chard may be harvested repeatedly if clipped so as to leave about 1 inch of the crown above the ground. Cauliflower should be bleached. As soon as the head has started to form, the leaves should be tied over the top. Broccoli should be harvested when the head is compact. This is before bloom. Light frosts improve the quality of broccoli. Harvest and utilize cabbage when the heads are firm and compact and before they burst.

Summer squash are used when they are small and tender. The zucchini squash is used when it is 6 to 8 inches long. Winter squash and pumpkins are ready when the shell is hard enough to resist the thumb nail.

Tender young beets from thinning, beet tops, and turnip tops make excellent greens.

Always handle vegetables carefully. Cutting and bruising will cause them to

decay more rapidly. Radishes, tender carrots, lettuce, and greens can be crisped by plunging them in a pan of cold water immediately after harvesting. Keep them wrapped in a damp towel or cloth and they will remain crisp for several hours.

October

1. Harvest and store root crops, cabbage, and celery for winter use. Dig and store potatoes.

2. Remove all refuse and clean up the garden to destroy insects and diseases.

3. Harvest and store pumpkins after frost nips vines but before they are frosted.

4. Dig and store a few parsnips. Put a few inches of leaves and a little dirt over rest of row.

Storage — Live storage is the most economical method of food preservation. Vegetables most adapted to storing, such as root crops, potatoes, cabbage, onions, pumpkins, and winter squash should be stored, so that jars are available for canning greens, peas, beans, and corn.

Good storage facilities can be provided for at least a limited amount of vegetables at little or no cost. Know the conditions the vegetables prefer for storage and treat them kindly. Follow a storage chart. Vegetables for storage should be harvested as soon as they mature. Root crops and potatoes are better off in the ground than in a pit or trench if they are ready for storage before the cool season approaches. Store in late fall.

Root crops and potatoes require lots of moisture in the air and keep best when stored at about freezing temperatures. Pits or mounds are desirable. Sand boxes are better than bins when the air in the storage room is dry. When using mounds or pits put about 2 bushels of mixed root crops in each mound. When using sand boxes put several kinds in each box. Discard all immature, all large and overgrown, all cut or bruised and all irregular

shaped vegetables. Leave about 1 inch of stem on all root crops that are to be stored. The soil should not be wet when root crops are dug for storage, and storage crops should never be handled when wet.

Cabbage requires moisture and cool temperatures, the same conditions as root crops. It will stand light frosts. Trenches are satisfactory for storing cabbage. They should be wide enough so two heads can be placed side by side with all outer leaves on, roots up, and placed on 2 or 3 inches of straw or dry leaves. The trench should be deep enough that the roots extend above the surface of the ground 5 or 6 inches. Cover the mound over the heads with straw and then dirt; add more dirt as extreme cold weather approaches.

Squash and pumpkins are harvested with the stems on before frost. For storage they require a dry warm place. The straw pile or a warm attic room are suitable storage places. They prefer a temperature of 50 to 65 degrees. Shelves in the basement make a popular place. Do not allow these vegetables to touch one another while in storage.

Onions like it cool and dry. They are harvested when the tops are yellow and have fallen over. Leave them spread out in an airy shed for several days before topping. Large thick-necked onions will not keep well and should be utilized first. Onions may be stored in trays or net bags, in cool attics or outbuildings where there is no danger of freezing.

Celery may be stored in trenches in the garden similar to those used for cabbage. However, the roots of the celery are left on when transplanted in wet soil in the bottom of the trench. The celery may be allowed to touch and should be firmly packed in the trench in an upright position.

Transplant boxes placed in the storage room may be used to store small amounts of celery, head lettuce, Chinese cabbage, and immature cabbage. Keep the soil in the box moist but do not get water on the green portions of the plants.

Green tomatoes may be harvested before frost. When wrapped in paper and



stored in a dark place at about 65 degrees they will gradually ripen, retaining most of their flavor.

Here are a few special hints on storage. Do not store turnips and cabbage in the house basement as their odor may go through the entire house. Apples and celery will absorb odors and so acquire unpleasant flavors; do not store them with cabbage, potatoes, or turnips. Always store vegetables in a dark place. Examine stored products frequently to prevent spoilage spreading. Keep the storage place clean. A layer of sand an inch or 2 deep on the basement floor frequently moistened will assist in keeping up the humidity. Boxes and baskets are preferable to built-in bins. By their use, less handling of the vegetables is necessary and they are easier to keep clean. A basement storage room or an outdoor storage cellar requires little investment and will pay dividends for many years.

November

1. Manure and plow garden if it was not done last month.
2. Clean out hotbeds, cold frames, and flats.

Preparing the Garden for Winter — As soon as frost kills a garden all dead plants and refuse should be cleaned off and placed in the compost heap. Extremely woody material or plants badly diseased and harboring insects may be piled and burned. Remove all stakes and poles and store them away for next year.

Soil is the basis of good gardening and fertility must be retained. If well-rotted barnyard manure can be secured, a liberal application, 20 tons per acre (1 pound

GROWING VEGETABLES IN THE DENVER REGION

per square foot) should be made. Do not apply poultry manure in excess of 1 pound per 10 square feet. Fall plowing will assist in decomposing the organic matter applied and freezing and thawing during the winter will help make a deep, mellow seedbed for spring planting. In the spring, before planting, the compost you have made may be worked into the soil as a top dressing as the seedbed is prepared. Do not apply commercial inorganic fertilizers in the fall but save them for use during the growing season.

December

1. Start next year's garden plan on paper while this year's experience is fresh in mind.
2. Get all tools ready for next year's use.

Care and Repair of Tools — Good tools well cared for will give you lots of pride and satisfaction. They will also lessen labor. We hope that you have kept them shiny and sharp during the season. Remember, the place to use a tool is in the garden but when not in use each tool should have a place of its own to make

it easy to find. Some tools such as rakes, hoes, and shovels can be hung on the wall on nails or peg boards. Outline the place for the tool and perhaps paint the space it occupies.

After the tools have been thoroughly cleaned, the wooden parts should be painted; bright colors will make them easier to find. All metal parts, especially the shiny parts, should be cleaned with kerosene and then coated with oil to prevent rust. Moving parts such as the wheels and bearings on the hand cultivator or lawn mower should be packed with a good grade of cup grease. Spray equipment should be thoroughly cleaned and parts which might rust should be well oiled. If you find on inspection that there are worn-out or broken parts, replace them now.

Never leave tools lying around. If not in immediate use, tools such as spades and forks should be stuck upright into the ground. Rakes and hoes should be propped against a tree or fence if possible; never leave them lying flat with their tines or blades upright.

VEGETABLES AT THE PLANT SALE

You can buy vegetable plants, ready to set out in your garden, at the annual Plant Sale of Denver Botanic Gardens, May 10 and 11, 1974. Those expected to be available are: Big Boy, Fantastic and cherry tomatoes, green chili peppers and bell peppers, egg plant, broccoli and cabbage.

Also: Raspberry bushes, Ogallala strawberry plants, and peach, cherry and plum trees. Rhubarb roots too.

Besides that, there will be just about any flowering plant you could want.

THE DWARFS ARE HERE TO STAY

Herbert C. Gundell

Herb Gundell, well known to all gardeners in the Denver area, is Colorado State University extension director for the Denver area.

If you have any doubts about dwarf fruit trees — forget them! Dwarf fruit trees are here to stay. In the future we can expect only further improvement to be made as pomologists and scientists cooperate to bring the home gardener even more adaptable types and varieties than we have available today. A dwarf fruit tree could be any variety of your own choosing that is either grown on a dwarfing type of rootstock or understock, or is the result of splicing two, three or four types of fruit trees together, one upon the other, in such a manner that the dwarfing of the tree is actually produced by an interstem graft or splice that determines the growth pattern and total attainable height of that particular tree.

Almost every type of fruit is available today in a dwarfed form. Naturally, the most attractive to gardeners in the mile high region and the eastern slope of the Rockies are apples, cherries and plums. There are also peaches, apricots and nectarines available on dwarfing understock but the hardiness of these in this region is highly questionable.

What is the history behind this dwarfing and how is it achieved? Some dwarfs grow naturally the way they do because they were found that way in nature and have been propagated from plants that mutated from the normal standard sized tree. The history of dwarf stocks for

fruit originates in England where pomologists at East Malling Research Station, in Kent, collected natural dwarf apple trees from many countries and tested them until they had weeded out the less dependable ones. They finally came up with nine selections which are known as Malling, or EM I through IX. The major difference between these dwarfs is that they have different adaptabilities and different levels of dwarfism exerted on a standard variety.

You may also run across the dwarf stock name of Malling-Merton. This is a rootstock produced by breeding one of the Mallings with another variety of apple to obtain better root anchorage or resistance to disease.

Other Understocks

Traditionally and historically the Malling understocks have not been found totally reliable in all localities of the United States. Because of this, certain major fruit producers have selected their own type of understock in order to guarantee the home gardener a dependable tree from which he can hope to harvest from two to four bushels of fruit each year. Some use selected crab-apples for understock and then splice on that a section of Malling upon which they finally splice a choice selected variety of fruit which will then supply the characteristics of the normal fruit



Dwarfs produce crop in 3 years.

variety. This tree will not exceed the overall dimensions of whatever the inter-graft or spliced piece of Malling-Merton stock dictates. Such dwarfing trunk sections are often referred to as “Clark,” after an amateur fruit gardener in Iowa who discovered this mutated natural dwarf in a home garden.

There are also some new and quite interesting spur-types of dwarf apples on the market. Spur-types are natural genetic dwarfs that are shorter than a standard tree. Without any additional dwarf intersplice, they are called a “semi-dwarf”, at about fifteen feet. They produce their crops on spurs not only in the outer periphery of the tree, but also on all branches on which short spurs can occur.

Why Grow Dwarfs?

Why should you, as a home gardener, select dwarf fruit trees for your garden? I see in dwarfs some fundamental advantages. For instance, a standard sized apple tree, say Delicious or Jonathan, will require from six to ten years of

culture in the average garden, in this region, before it produces the first crop of fruit. Dwarfs, on the other hand, will produce the first crop in about three years, sometimes even sooner. If you are in your senior years you may not have ten years to wait for the results of a tree you planted.

The second advantage of dwarfs is that this tree will not exceed in size your ability to prune, to spray and to pick the fruit, from the ground or a short ladder. It greatly reduces the hazards of working on a tall ladder or climbing a tree. It is virtually impossible to spray a standard sized mature fruit tree with hose attachment type of sprayer the average home gardener uses. That's no problem with the dwarf.

You can plant as many as sixteen dwarf fruit trees in the space required by a single standard tree when fully grown. And finally, dwarfs do not have to root as deeply as standard trees; their roots can flourish in the shallow layers of better soil.

My Own Orchard

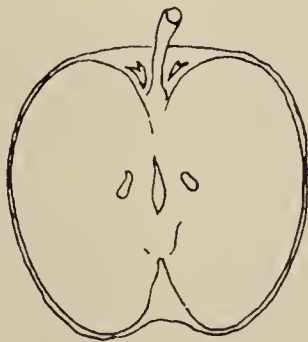
I am not only convinced about the quality of dwarf fruit trees, I have quite a collection of them in my own back yard. I am testing several types of dwarfs from the New York Cooperative Fruit Testing Station at Ithaca, New York, including the newly introduced variety, Empire, a Macintosh-Delicious cross that matures in our garden normally around late August or early September. I have now only one tree that has produced for three years as I lost my entire “orchard” in the freeze of 1969, and replaced it with the same varieties in 1970. I'm hopeful that in 1974 at least one or more of these trees will produce fruit. The orchard includes two Stark Crimson spur types from Stark Brothers Nursery in Louisiana, Missouri. I also have two dwarf pears of the Maxine variety and two dwarf peaches — Valiant and Victory — both of which came

through the severe winters of 1970-73 with exceptionally little damage.

Following is a list of dwarfs that I believe to be worthy of trial in this region. If you are interested I can supply the address of the New York Cooperative Fruit Testing Station. You have to

become a member of this organization to buy their dwarf trees. They are more reasonably priced than most others from competitive nurseries, and you will receive a credit of the membership dues on your first order.

FRUIT	VARIETY	HEIGHT OR STOCK	MATURITY
Apple	Red Delicious	Depends on dwarfing stock	Late
	Golden Delicious	Depends on dwarfing stock	Late
	Jonathan	Malling IX 1/4	Late
	Rome Beauty	Malling-Merton 26	Late
	Lodi	1/2	Fall
	McIntosh	Malling VII 1/2	Late Fall
	Wealthy	Malling-Merton III	Early Fall
	Empire (N.Y. State)	2/3	Late Summer
	Delcon (Natural)		Fall
	Jumbo (Stark)		October
	Gala (Stark)		September
Pear	Bartlett	Old Home	Fall
	Red Bartlett		Fall
	D Anjou		Late
	Bosc		Late
Peaches	Reliance	3-5 Feet 3-5 Feet	Late Summer
	Early Elberta		Summer
	Suncrest		Late Summer
	Valiant		Late Summer
	Bonanza		Late Summer
	Starlet		Summer
Cherries	Comet		July
	Meteor		July
	North Star		July
Plums	Stanley (Natural)		Late
	Waneta		Late Summer
	Sapa		Late Summer



Exotics of COLORADO

SQUASHES

Cucurbita spp.

Helen Marsh Zeiner

If you have a vegetable garden, you probably raise at least one of the many kinds of squashes available to the home gardener. All of these various squashes belong to the pumpkin family, *Cucurbitaceae*. This is a very large family which includes edible plants such as squash, pumpkin, watermelon, cucumber, and cantaloupe as well as ornamental gourds. Members of *Cucurbitaceae* are mainly tropical or subtropical in origin and are handled as tender annuals in the garden.

The characteristic fruit for the family is the pepo, a modified berry with a leathery or hardened outer part consisting of receptacle tissue and a fleshy inner part with numerous seeds. In some types of squash the receptacle tissue does not completely cover the ovary and suggests a turban in appearance.

Squashes and pumpkins belong to the genus *Cucurbita* (Latin name for gourd). Included in *Cucurbita pepo* L. are several different forms or varieties, such as common field pumpkins, pie pumpkins, vegetable marrows, summer crookneck squash, scallop and patty pan squash, and some small gourds. *Cucurbita maxima* Duchesne includes large autumn and winter squash such as Hubbard squash, Boston marrow, and turban squashes.

Cantaloupes and muskmelons are varieties of *Cucumis melo* L., while the cucumber is *Cucumis sativus* L. Watermelon



Zucchini Squash

and citron with its hard white flesh are varieties of *Citrullus vulgaris* Schrad.

The first American colonists were introduced to squash by the American Indians, and in turn introduced squash to England, the Netherlands, and other European countries. As the cultivation of squashes spread around the world, they were accepted as excellent vegetables but few users knew that they originated in America.

The name squash is derived from the Algonquin Indian word askoot-asquash or

askutasquash. Roger Williams in 1643 wrote the word as askutasquash, "their vine apples, which the English call them squashes." He reported several colors and said that they were about the size of apples.

Indians used the name askootasquash for both pumpkins and squashes, but the colonists used the word squash for summer squashes and carefully distinguished them from pumpkins. Since both summer squashes and pumpkins are varieties of *Cucurbita pepo* L., it makes no real difference whether they are called summer squashes or summer pumpkins.

Sometimes pumpkins and squashes are distinguished on the basis of the fruit stems, said to be smooth and soft at maturity in squash and hard, woody, and ridged at maturity in pumpkins.

Those vegetables usually called squashes can be divided into two very general groups: First, bush or summer squashes, growing compactly and with fruits which are eaten when immature; secondly, vine or winter squashes, sprawling widely and with fruits eaten when mature.

By the time white man set foot on the eastern shores of North America, pumpkins and squashes had been cultivated for hundreds of years by practically every Indian tribe in eastern North America,

Central America, and South America. Pumpkins as well as squashes were used for soup, were boiled, or were tossed on the fire and baked whole. Sometimes the pulp was made into cakes and fried. Indians ate the seeds of both squashes and pumpkins. Sometimes they were ground into meal and made into bread or gruel. They were a nutritious food which could be stored for winter use. Squash and pumpkin seeds were sometimes buried with the dead for food on their long journey.

Squashes may have been cultivated first by the ancient Peruvians, for pottery thousands of years old found in the graves of Inca and pre-Inca Indians was often made in the shape of squashes. Many different cucurbits were depicted — in fact, all the basic types we know today. We have improved these basic types, but modern squashes are recognizable as being the same general kinds cultivated so long ago.

Of the many varieties of squash known today, all are believed to be of American origin with the possible exception of *Cucurbita moschata* Duschesne, the cushaw or winter crookneck, which some authorities believe may have arisen in Eastern Asia. Others believe that it, too, is American in origin. Squashes are indeed foods America gave the world.

The Way to Begin A VEGETABLE GARDEN Is to Begin

If you want your own home-grown vegetables go out there in the yard and start digging up the soil.

Dig up whatever space you have. If you don't have enough, dig up the place you intended to put flowers next summer, or dig up part of your lawn. You could get a better shaped lawn if you cut off some corners and turn them into garden.

A vegetable garden — or any kind of garden — is work, plain old hard physical work. It's good for you. Get out the spade.

Read the articles in this magazine. These people know what they are talking about. Here is the information you need, for this area, where your garden is. Then enjoy the spring — in sunshine, clouds or rain — by going to work.

Books on VEGETABLES in

The Helen Fowler Library

Peg Milroy

The Helen Fowler Library has a rich collection of material on vegetable and fruit gardening, ranging from entire books on the subject to pamphlets, to items in gardening encyclopedias. The following list contains a number of those references but is by no means a complete listing of materials on the subject available in this library. *Brief notes which are the personal (and amateur) opinions of the compiler have been made on books written within the past 25 years.*

- Abraham, George.* The green thumb book of fruit and vegetable gardening. Englewood Cliffs, NJ, Prentice-Hall, 1970. In addition to being a tremendously useful guide for growing fruits and vegetables this book contains interesting tips and recipes for using the products you grow.
- Albaugh, Benjamin Franklin.* Home gardening; vegetables and flowers. New York, Grosset & Dunlap, 1917.
- Bailey, Liberty Hyde.* The principles of vegetable gardening. New York, The Macmillan Co., 1941.
- Beck, Barbara L.* Vegetables. New York, F. Watts, 1970. Here is a compendium of information for young gardeners, junior and senior high school age. Vegetables are divided into plant families and the level of writing is otherwise such that adult readers, too, will find the book interesting.
- Bennett, Ida Dandridge.* The vegetable garden. Garden City, NY, Doubleday, Page & Co., 1929.
- Blair, Edna.* The food garden. New York, The Macmillan Co., 1942.
- Bridgeman, Thomas.* The kitchen gardener's instructor. New York, The author, 1864.
- Brill, Francis.* Farm-gardening and seed-growing. New York, Orange Judd Co., 1884.
- Burr, Fearing.* The field and garden vegetables of America. Boston, J. E. Tilton & Co., 1865.
- Burrage, Albert Cameron.* Burrage on vegetables. New York, Van Nostrand, 1954. This is certainly one of the most practical and comprehensive of all the books reviewed here. Its chief drawback is that it is somewhat dated; e.g., it advocates DDT for pesticidal use.
- Campbell, Mary Mason.* Betty Crocker's kitchen gardens. New York, Universal Publishers, 1971. As indicated in the title, this volume is directed toward the cook who also likes gardening. In addition to the usual information on growing vegetables and herbs, it contains small sections on midget vegetables and on sources for seed and other gardening needs.
- Carleton, R. Milton.* Vegetables for today's gardens. Princeton, NJ, Van Nostrand, 1967. The author covers the growth and use of all the well known vegetables plus information on gardening tools, plant protection, soil preparation, etc.

- Coulter, Francis C.* A manual of home vegetable gardening. Garden City, NY, Doubleday, Doran & Co., 1942.
- Crockett, James Underwood.* Vegetables and fruits. New York, Time-Life Books, 1972. This is a highly informative book on planning and planting vegetables and fruits with a section on herb growing. It is pleasingly arranged and lavishly illustrated.
- Cyphers, Emma Hodgkinson.* Fruit and vegetable arrangements. New York, Hearthside Press, 1963.
- Dakers, J. S.* The garden frame. London, Cassell & Co., 1945.
- Dempsey, Paul W.* Grow your own vegetables. Boston, Houghton Mifflin Co., 1943.
- Evelyn, John.* Acetaria: a discourse of sallets. Brooklyn, Brooklyn Botanic Garden, 1937.
- Fenton, Carroll Lane.* Plants we live on. New York, John Day Co., 1971. A book for young people, this volume is not a gardening book, but the story of grains and vegetables relating their history and economic importance.
- Figuer, Louis.* The vegetable world; being a history of plants, with their botanical descriptions and peculiar properties. New York, D. Appleton & Co., 1867.
- Finck, Henry Theophilus.* Gardening with brains; fifty years' experiences of a horticultural epicure. New York, Harper & Brothers, 1922.
- Foley, Daniel J.* Vegetable gardening in color. New York, The Macmillan Co., 1942.
- Fox, Helen.* Gardening for good eating. New York, The Macmillan Co., 1943.
- Fullerton, Edith Loring.* How to make a vegetable garden. New York, Doubleday, Page & Co., 1905.
- Giles, Dorothy.* The little kitchen garden. Boston, Little, Brown & Co., 1926.
- Green, Samuel Bowdlear.* Vegetable gardening. St. Paul, Webb Publishing Co., 1896.
- Gunnison, Olive.* Learning to garden. New York, Funk & Wagnalls Co., 1948. Though not specifically a vegetable gardening book, it has a fairly large section on vegetables. It is directed toward beginners but has good ideas for the more experienced gardener too. The drawings are particularly clear and descriptive.
- Henderson, Peter.* Gardening for profit. New York, Orange Judd Co., 1891.
- Heriteau, Jacqueline.* The how to grow and cook it book. New York, Hawthorn Books, Inc., 1970. The first part of the volume is a highly informative guide to growing and harvesting vegetables. Other parts cover cooking vegetables and growing herbs, fruits and nuts, all written amusingly but practically.
- Kain, Maurice Grenville.* Food gardens for defense. New York, Greenberg, 1942.
- Keen, Grace.* Let's all grow vegetables. Minneapolis, Univ. of Minnesota Press, 1944.
- Kraft, Ken.* Growing food the natural way. Garden City, NY, Doubleday, 1973. This is an up-to-date and comprehensive book on organic gardening. It is very easy reading and contains many good ideas. The last chapter explores the question of whether a country home is right for you.
- Kraft, Ken.* The home garden cookbook, from seed to plate. Garden City, NY, Doubleday, 1970. By the preceding author, here is another easy-reading book with helpful planting advice and numerous recipes for your home-grown vegetables. The color plates are excellent.
- Kressy, Michael.* How to grow your own vegetables. New York, Creative Home Library, 1973. As the title indicates, this is a guide to vegetable and small fruit growing. It is divided into sections on preparing the soil, growing the plants and harvesting the produce. The beginning gardener should find it most useful.
- Matson, Ruth Appleton.* Gardening for gourmets. Garden City, NY, Doubleday, 1959. Though written in an elementary manner, this book perhaps should be left to the person whose hobbies are gardening and cooking rather than the one who

- gardens for economic reasons. The line drawings are delightful; the recipes, mouth-watering.
- Ogden, Samuel R.* How to grow food for your family. New York, A. S. Barnes & Co., 1942
- Organic Gardening & Farming Magazine.* Best ideas for organic vegetable growing. Emmaus, PA., Rodale Books, 1969. For readers interested in natural gardening this is perhaps one of the most readable and useful of the organic gardening books. It is extremely comprehensive and well arranged.
- Pellegrini, Angelo M.* The food-lover's garden. New York, Knopf, 1970. The author is a professor of English who has a love of the soil and the ability to share his instinct for the good life — especially good eating — with the reader. While the gardening information applies specifically to the West Coast, the book has useful information for all would-be gardeners.
- Pyenson, Louis.* Pest control in the home garden. New York, The Macmillan Co., 1944.
- Quinn, Patrick T.* Money in the garden. New York, The Tribune Assn., 1971.
- Quinn, Vernon.* Vegetables in the garden and their legends. Philadelphia, J. B. Lippincott Co., 1942.
- Randolph, John.* A treatise on gardening. Richmond, Appeals Press, 1924.
- Rockwell, Frederick Frye.* Around the year in the garden. New York, The Macmillan Co., 1917.
- Selsam, Millicent.* The carrot and other root vegetables. New York, Wm. Morrow & Co., 1971. This is a delightful book for juveniles having superb photographs and text written to be enjoyed and understood by the very young (up to 12 years) gardener.
- Selsam, Millicent.* The tomato and other fruit vegetables. New York, Wm. Morrow & Co., 1970. Here is a companion volume to the preceding book. It is written and illustrated in the same manner.
- Sunset Magazine.* Vegetable gardening. Menlo Park, CA, Lane Book Co., 1961. This manual is very well arranged and easily understood. The young gardener especially should find it useful as a basic book on growing vegetables.
- Taylor, George Morrison.* British herbs and vegetables. London, Collins, 1947.
- Tiedjens, Victor Alphons.* The vegetable encyclopedia and gardener's guide. New York, The New Home Library, 1943.
- Vick, Edward Colston.* Audels gardeners and growers guide. New York, T. Audels & Co., 1928.
- Vick, James.* Vick's flower and vegetable gardens. Rochester, NY, The author, n.d.
- Watson, Aldren Auld.* My garden grows. New York, Viking Press, 1962. Written for the juvenile, this book does not go into specifics of gardening but directs a child's thoughts toward the delights of growing his own vegetables.
- Watts, Ralph Levi.* Vegetable gardening. New York, Orange Judd Co., 1912.
- Wiener, Joan.* Victory through vegetables. New York, Holt, Rinehart & Winston, 1970. Here is a book for the far-out vegetable lover. It is not a gardening book, but a book of vegetable recipes including a large section on macrobiotic dishes.
- Wickenden, Leonard.* Gardening with nature. New York, The Devin-Adair Co., 1954. This is an easy-reading book of fundamentals of gardening without chemicals, written by a chemist! In addition to a large section on vegetables, it has material on fruits, herbs, garden tools, pests and diseases and attracting birds and other predators.
- Work, Paul.* Vegetable production and marketing. New York, Wiley, 1955. For the gardener who is considering growing vegetables for a living, this textbook-like volume would be an invaluable reference. Among other things, it contains a comprehensive bibliography on each vegetable.

VEGETABLE GARDENING A CENTURY AGO

Excerpts from the book, *The American Home Garden – Principles and Rules for the Culture of Vegetables, Fruits, Flowers and Shrubbery*, by *Alexander Watson*, published by Harper and Brothers, New York, in 1859.

It is related of one Eliezer, in proof of the vastness of his knowledge, that "he made not less than three hundred constitutions concerning the manner of cultivating cucumbers."

Very early peas are generally small. Suppose we desire to produce a variety in which the seed should be larger, but the crop not materially later. Then, on the general rule, we may fertilize the cedo nulli with the Spanish dwarf, and expect to accomplish our purpose; but if we fertilize the latter with the former we ought not to expect success, though it is not inconceivable that we might succeed, from the accidental concurrence of certain occult causes or combinations connected with the previous processes through which these varieties may have passed in arriving at their present state.

New varieties are often introduced from foreign countries, either by scientific research or under the stimulus of interest. The cocoanut squash was introduced from Valparaiso by the late Commodore Porter; and the common white kidney bush-bean, which now abounds in our stores and markets, was brought into New York from Madeira some thirty years ago, when dumpling beans were scarce.

Broadcast sowing: To perform the operation rightly, a basket or sheet containing the seed is slung upon the right shoulder and across the breast, so as to be partially under the left arm and governed by the left hand. The sower beats time as he steps, dipping a handful of seed with his right hand at each advance of the left foot, and casting it with a steady sweep as he steps forward with the right. A good sower does not cast the seed from his hand at once, and right before him, as in feeding chickens, which would cause it to fall in streaks, but, by adroit management with his thumb, and an upward cast, spreads it as it issues, causing it to

fall in a broad, scattering shower, like the spreading jet of water drops from an engine-pipe when thrown into a showering semi-circle by the finger of the engineer.

In drill sowing, also, a pinch of seed only is taken, which in the process of sowing, is strickled along the drill by just such a motion of the thumb upon the fore and middle fingers as a skilled housewife uses in carefully salting a steak. A smart boy accustomed to the work will sow evenly, and of any desired thickness, at the rate of a fast walk, or faster in an emergency.

Various preventatives (for the striped cucumber bug) some of which may be worthy of farther trial, have been suggested, such as planting an onion, or a tomato in each hill. Numerous remedies have also been proposed, as soot, lime, ashes, plaster, snuff, etc., to which may be added, as equally efficient, sand. They are all mere temporary disturbers of the insect, which, from its timidity, retreats instantly upon the slightest annoyance, either hiding quickly under leaves, or in the earth, or at once flying away. They may apparently be almost driven in a flock by a liberal broadcast of any powder, but for the rest, even if it be Scotch snuff, it may be presumed they only sneeze.

The cut worm: The crow, with some other birds, and a species of dragon-fly, are inveterate enemies of the cut worm, and Fitch recommends the making of deep holes with a stick about their places of resort, into which they fall, and, it is supposed, can not get out. This, however, would appear not only doubtful, but also as involving, perhaps, more labor than the ordinary and direct course, which is simply to glance along the rows of your crop early in the day, and wherever the presence of the marauder is detected, either by a cut leaf or a wilted plant, search for him just below the surface and crush him.

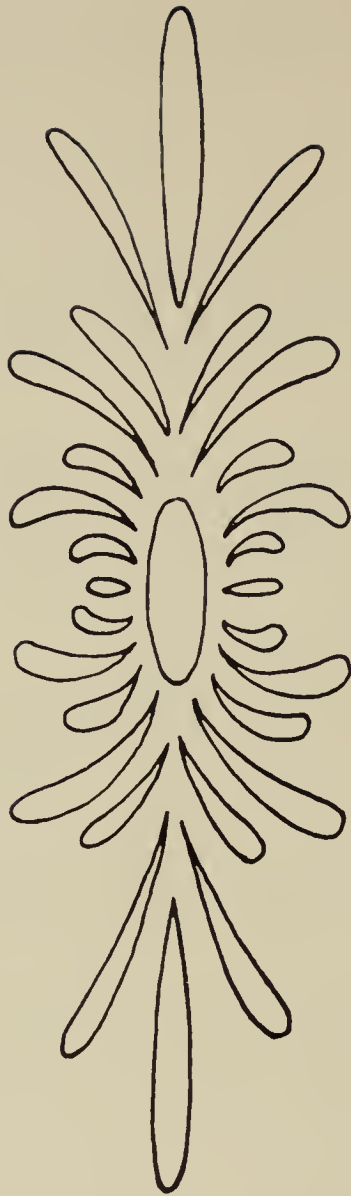
Corn: Plant in rich, warm soil, in hills three feet apart, five grains in a hill, an inch deep. When well up, thin to the three or four best plants. Hoe often, and dress with ashes and plaster.

Small cucumbers of any kind, when pickled, are properly called "gherkins," but this name has also been given to a very small, seedy, worthless, burr-like West Indian cucumber, of which poor pickles are sometimes made.

The young plants of nasturtiums are highly esteemed in salads. The flower-buds and the green seeds, with their tendril-like stem, make pickles, which are often preferred to capers.

Onions that are too large for sets, and the refuse onions that remain over from the winter's consumption, when planted in the spring, in rich soil, yield mild and pleasant green onions known as escallions, which are ready for use almost as early as shallots, but are greatly preferable to them.

The culture of the potato is so well known that it need scarcely be mentioned as a garden vegetable.



Gifts and Bequests

Lifetime and testamentary gifts to the Denver Botanic Gardens are deductible in computing both income and death taxes. The Trustees ask anyone who wishes to add to the Gardens' limited resources to consider making a gift of either real or personal property during life, or a bequest or devise by will. Such disposition can be made specifically either for the Development Fund or the Endowment Fund or both. The proper designation of the recipient is *The Denver Botanic Gardens, Inc., a Colorado Corporation*.

FORM for GIFT or BEQUEST

I hereby give ☐ bequeath ☐ to The Denver Botanic Gardens, Inc., a Colorado Corporation, a non-profit, educational institution, the following:

Endowment Fund, Amount: _____ Development Fund, Amount: _____
to be applied for the purposes of The Denver Botanic Gardens.

Name _____

Address _____

City _____ State _____ Zip _____

Signature _____ Phone _____

LOOK BEFORE YOU BUY

A GREEN THUMB REPORT ON SOME QUESTIONABLE PLANT ADVERTISING

They're tempting — those glowing advertisements offering a large quantity of trees, shrubs and other flowering plants at a low price. The plants seem to be Miraculous: trees that will grow anywhere provide shade in a year or two, bear beautiful blossoms; shrubs that will, this very summer, be covered with a mass of brilliant blooms; enticingly named exotic flowers that are better than any you've known. It sounds as though you could elegantly landscape your property for a few dollars.

Are they that good?

Some of them are fine. Almost any plant that lives and grows is a real pleasure. But it is possible that you may not get what you expect. Maybe you should check that ad again before you order.

Check the tulip advertising as to bulb size, says Stanley Brown, Jr., of Colorado Nurserymen's Association. A "two-inch bulb" may mean a bulb that is two inches in circumference, which is less than 3/4 inch in diameter, and not very promising. The word "Holland" in bulb advertising may not mean that the bulbs come from the Netherlands. There are Hollands in the U.S. The Netherlands growers are rather strict in their standards but some others are not.

Waxed rose bushes shipped in, Mr. Brown cautions, may not always be satisfactory. If the plant begins to leaf out

before it is sold and planted it needs water and there is no way to apply water through the sealed wrappings of these roses. You could be buying a plant that is severely handicapped. For the novice, container grown roses are surer.

At least one tree advertised and sold in the Denver area stands little chance of surviving here, according to the Nurserymen's Association. Few arborvitae have been grown successfully in this region of low humidity and drying winter sun.

Mr. Brown advised would-be purchasers to check carefully the size of the trees advertised. A four-year-old Colorado Blue Spruce may be only four inches high — and likely to be cut down by the lawn-mower or trampled, if it lives. He cautioned against buying bare root trees that are shipped or mailed in. They may be delayed and the roots dried out before being delivered. If you purchase a bare root tree by mail, Mr. Brown suggested that you soak the roots in water overnight before planting.

B. B. B. Investigation

The Council of Better Business Bureaus, Inc., with the cooperation of the American Association of Nurserymen, has completed an investigation of flowering shade tree advertising that reveals some practices that may be more shady than the trees. Their report, issued this year, says:

"For over a decade some mail order nursery sales enterprises have been promoting fairly common trees such as Ailanthus, Black Locust, Honey Locust, Silver Maple, etc. with fancy coined names, or unfamiliar and/or incomplete botanical names. Many claims for them have been exotic, exaggerated, or false."

In a survey of nurserymen the BBB learned this about the Thornless Honey Locust, *Gleditsia triacanthos inermis*:

"The experts did not believe that the 2 to 4 foot seedling delivered 'Arches out in a living masterpiece of beauty in JUST ONE SINGLE YEAR,' as advertised. 'Except for . . . California, where the growing season is 300 days, they agreed that it would not *add* 6 feet of growth to its original 3 to 4 feet its first growing season,' again, as advertised. Commenting on the illustration in an advertisement, they said that "it would take about five years to reach the height illustrated in the advertisement." The advertisement said that you could buy "A FLOWERING SHADE TREE That Soars This Fast IN JUST ONE YEAR." Other conclusions:

"If it is a 'living umbrella' as described in the advertisement, it will be some years before one could stand or even sit under that 'umbrella.' "

"The experts were solidly opposed to recommending it (Thornless Honey Locust) as a flowering tree, most describing the flowers as 'insignificant,' 'inconspicuous,' 'very small and not showy.' "

Hardwood Trees?

Hybrid poplars, advertised as "Incrassata candensis" and "Charkowiensis incrassata" were claimed to grow "over 43 feet in only 7 years," to last "for generations to come," to be "hardwood trees" with "a high resistance to disease, pests, winds and ice damage."

Says the BBB report: "The Forest Experiment Station indicated that the average life of the hybrid poplars is 20 to 30 years." "The experts were unable to respond specifically because of the improper botanical names quoted in the advertisement."

"They reported resistance from canker varies from 'some' to 'none'. And, the same for insect resistance. Most agreed that there was 'very little' to only 'some' resistance to ice and wind damage." Finally, they said that the average consumer "would consider hybrid poplars as softwoods because of the pulpy, brittle character of the wood."

Buying trees and plants is like buying land; you ought to see it and know something about it before you buy.



*Punica
granatum*

Pomegranate



FOCUS on

Punica granatum

in the
Boettcher Memorial
Conservatory

Peg Hayward

Punica granatum, Linn, is the only member of the family *Punicaceae*. Botanists believe that the pomegranate and the cactus may have had a common ancestor long ago because of certain features of both the flower and the fruit. The Swedish botanist, Linnaeus, named the pomegranate *Punica* in 1753 since this was the classical name for Carthage, the city from which the ancient Romans first obtained the fruit. The English word "pomegranate" means "apple of many seed."

In prehistoric times the range of the pomegranate was extended by cultivation from its native home in western Asia and northwestern India to all the Mediterranean countries. In modern days it has been carried to tropical and subtropical regions all over the world, where it is grown for its edible fruit and ornamental flowers. The plant is so prized in Spain that its flower is her national emblem.

Punica granatum is bushlike when wild, but under cultivation it is trained to grow as a small tree. It reaches a height of 15 to 20 feet and bears many slender branches. The plant suckers freely from the base and these suckers must be constantly removed if a tree form is to be maintained. The deciduous leaves are narrow, oval or oblong, shiny, 1 to 3 inches long and tapered at both ends. The large waxy, orange-red blossoms of the pomegranate appear for several weeks during the spring. The crinkled petals are fiery in their brilliance. Blossoms are followed by thick-skinned fruits which are variable in size, ranging from 2 to 4 inches in diameter. They are subglobose,

or somewhat flattened with heavy tubular calyx and when ripened the fruits are yellowish to bright red in color. The edible portion of the pomegranate is the seed, the outer coat of which instead of being hard, consists of a delicate tissue filled with sweet, fragrant, reddish juice. The fruit is eaten out of hand or the juice is used in the preparation of refreshing drinks or syrups, including grenadine.

In the Orient, the root, rind, and seed, all rich in tannin, possessing astringent qualities, are used for medicinal purposes. Mohammed gave it spiritual properties also, for he said, "Eat the pomegranate — for it purges the system of envy and hatred". Both fruit and flower of the pomegranate were familiar to the Hebrews in Bible times. Hiram of Tyre used the fruit of the pomegranate on the pillars of Solomon's Temple. In classic mythology, Proserpine was forced to spend six months of each year in Hades because she had eaten six seeds of the pomegranate while living with Pluto.

The pomegranate is best known to indoor gardeners in its dwarf form, *nana*. It makes a dense, twiggy bush with narrow, shiny, apple-green leaves. The colorful orange or scarlet flowers in early summer are followed by small, but edible fruits. Some dwarf forms have been developed with particularly beautiful flowers at the sacrifice of palatable fruit. Propagation is by seeds, cuttings, or layers. Pot in standard soil, fertilize moderately late spring through summer, and keep evenly moist while growing, then on the dry side for winter rest. These lovely little trees can be kept under one foot tall by careful pruning and potting in small containers.

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The Green Thumb

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THE COVER

Horticulture House, 1355 Bannock Street, December 1958

George Kelly

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For further information write to Membership Chairman, Botanic Gardens House, 909 York Street, Denver, Colorado 80206, or call 297-2547.

The Green Thumb

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THE MAN WHO TAUGHT US HOW TO GARDEN

GEORGE KELLY

Wes Woodward

"Rocky Mountain Horticulture is Different," said George Kelly; and so is the man who said it.

George Kelly is not only different, he is a most unusual man. Almost everyone who meets him and comes to know him tries to describe his unusual qualities. The word they all come up with is "individual" — he is "a rare individual," "one of the last of the rugged individualists," a man possessed of "stubborn individualism." The word fits well on his spare, wiry frame.

When, in March, 1974, the Kellys were in Denver to take part in a rose symposium at Denver Botanic Gardens, George managed to detach himself from the affairs of that meeting for a brief interview.

Poising on the edge of his chair like an eagle, restless but attentive, he threw out scraps of information, ideas, reflections on life, and questions. He is a lean, active man of medium height, browned by the western sun and wind, carefully controlling an effervescent energy. Although he looked neat and formal in his "city clothes," one can't help picturing him in blue jeans, flannel shirt and hiking boots. He has a humorous view of the troubles of the past and an eager interest in the affairs of today. A half hour with him is stimulating.

Mr. Kelly spoke of his long campaign to teach the people about growing plants in Colorado, and of his present activities as horticulturist-archeologist-host at McElmo Canyon. The week before, he had been in Grand Junction to speak to a group of civic leaders and had found among them several middle-aged business men who had been cub scouts in a troop he had led, in the 1920's. He told, with sparkling eyes, of his explorations and "diggings" in the old Indian ruins on and

near his land at McElmo, and of the troops of nature lovers who come to see the Kellys and their work and their country each summer. He mentioned his time at Denver Botanic Gardens and, in a moment, explained succinctly the workings of that organization. He was fascinating, alive, independent, very much his own man; one cannot believe that he is nearing 80.

The best known thing about George Kelly is his book, which has become the Bible of Rocky Mountain horticulture.

"It is the first, and so far, the only publication to give the gardener of our Rocky Mountain region solid, dependable information that can be used without having to make allowances for differences in climate, soil and conditions." So wrote M. Walter Pesman in a foreword to George W. Kelly's *Good Gardens in the Sunshine States*.

That statement is as true today as when it was published in 1958. As the thousands of newcomers to Colorado begin to landscape their homes and plant their gardens, they turn to the only down-to-earth source of guidance for this region — Kelly's books. In them they find realistic, practical information and instruction on what plants to grow and how to grow them here.

His original book, published in 1951, was called *Rocky Mountain Horticulture is Different*. Its subtitle was, "How to Modify our Climate to Fit the Plants and How to Select Plants to Fit Our Climate." Fittingly, the first section says, "Let's Begin With the Soil," and then advises us to "Learn to Water Properly."

The third edition of that book, now available and increasingly in demand, is called simply *Rocky Mountain Horticulture*. We recognize it as the backbone of our knowledge about growing

plants in this region.

Mr. Kelly's most recent book, *Woody Plants of Colorado* (1970), is also a fundamental one, essential to our knowledge of the native plants of the state.

Through all his years of working with plants and teaching people about them, George Kelly has been most interested in our native Colorado plants and has told the world, over and over, that we should preserve them and learn to use them. When he recently gave a lecture at the Botanic Gardens Mr. Kelly called it "Colorado if Not Connecticut," expressing again, in another way, his constant theme. The lecture was published in the Summer issue, 1972, of *The Green Thumb*. It begins:

"I have been preaching the idea that 'Rocky Mountain Horticulture is different' for some 40 years now. A few people are beginning to get the idea and find that they can have as good gardens and parks here as any place in the world, if they learn to design their gardens, select the plants to construct them, and learn how to maintain these plants, in a way to fit Colorado's distinctive climate."

Later on he talked of native plants: "It is a curious habit of people moving into a new area to consider all native plants as weeds and try to grow all the familiar ornamentals that they have known as children. We have here many native plants that have adapted themselves to our dry climate and alkaline soil over the centuries, but we have not learned to use them. They are truly 'different' but no less beautiful. We can get all the landscape effects found in eastern gardens by using these native or adapted plants and save much water."

If he had never done anything else, his writings would have been sufficient to bring George Kelly renown as the founder and greatest advocate of Rocky Mountain Horticulture.

The American Horticultural Council recognized this in 1957 when it awarded him an Honorable Citation "for opening the way to successful gardening in a section of the country where growing conditions are adverse." And, in 1974,

Dr. A. C. Hildreth, Denver Botanic Gardens' revered Director Emeritus, observed, "George Kelly has probably done more to promote horticulture in this area than any other person."

But Mr. Kelly has done more than write books — much more. He has lived a full life of adventure, tribulations, successes and growth. He has practiced what he preached.

George Whitfield Kelly was born May 8, 1894, in Scotch Ridge, Ohio — "a little bit of a town with a population of 15." He was one of six boys in the family. The family moved to Chicago when he was five years old and to the wilds of Tennessee when he was twelve.

George's father was an evangelist and George was "not allowed to associate with the common kids." Since both parents were teachers, George got his education at home. He had dreams of becoming a forest ranger and was taking correspondence courses leading to that goal when his father died. That forced him to go to work to help support his mother and brothers. Says George, "I still had some correspondence help and was probably able to get three times more education than if I had gotten into forestry school."

At 18 George headed west and got as far as Salina, Kansas, where he went to work for the Union Pacific Railroad. George said later that he was never really



George Kelly with member of Junior Mountain Club, 1931.

interested in the railroad work. He moved on to a greenhouse job at half the pay, where he worked for a "wonderful Englishman." After the Englishman had taught George "all he knew," he got him a job at Elitch's greenhouse in Denver.

In Colorado, the young man found that working in the greenhouse — "potting for four hours and watering for four hours" — was monotonous. He wanted to get outside. Outside was where the plants that fascinated him grew.

In 1921 George met Charlie Rump, development manager for a company that had some 6,000 acres of land on Redlands Mesa, west of Grand Junction. (The Redlands lie just north of Colorado National Monument.) The Redlands Company, "a subsidiary of the power company," was trying to develop a settlement by attracting ranchers from all over Colorado to the project.

George saw a chance to own a farm, work with the soil, grow crops and flowers, and become prosperous in a progressive country. He left Denver and went to the Redlands, contracted to buy land and a house, and got two jobs to maintain himself while building up the farm. One of his jobs was to kill prairie dogs by distributing poison oats over the land, at \$1.75 a day, and the other was to carry the mail at \$9 a week.

Every other day he had the morning off from the prairie dog poisoning job to carry the mail on horseback to about 45 people on a 22-mile route. Within a year the mail delivery assignment was lost to a war veteran. But George was busy enough. He worked as community agricultural agent and advised other settlers about landscaping. And he kept things lively with a little orchestra he had organized.

Gradually, through mismanagement, the project turned sour. The company was building the houses the settlers had contracted for, but the houses cost almost double the expected price. The settlers were going deeper and deeper into debt. Nothing worked out as planned. After four years George went to work for the Grand Junction Seed Company. After six years he had to give up the dream.

Kelly is quoted as saying: "It was kind of a disappointment. There was the climate that was wonderful and the idea of starting something up from nothing which fascinates every young man. You could grow anything there except bananas and that was the most fascinating to me."

George sold his cow, his bees and all his remaining equipment, and bought a ticket on the train to Denver.

In Denver he worked for a year or so for Denver Wholesale Florists and another year or more as a salesman for Rocky Mountain Seed Co. Being a salesman did not appeal to him. He was much pleased when he got a job as landscape gardener for the Denver Public School system. During his eight years there he was doing the thing he wanted to do — working with plants outdoors and extending his knowledge of horticulture. In the depth of the depression, the schools decided to do without a landscaper and George was out.

It was at this time that he bought some land in Littleton and started his own nursery and landscaping business.

In 1944 the Colorado Forestry and Horticulture Association was organized, with George as one of its founders. All of George Kelly's love of the West and its plants, his unflagging energy, his urge to develop and improve all that he touched, was concentrated into the intense devotion and effort he gave the association in the next twelve years. At first, the address of the association was George Kelly's home. When CF&HA established a home of its own, Horticulture House on Bannock Street, George was installed there as editor, horticulturist and director.

As the first editor of *The Green Thumb*, George wrote for that magazine, put it together, and built it into a well-known, authoritative publication. Elinor Kingery, writing in the 25th Anniversary number of *The Green Thumb*, said that George "coped with the challenges, did the work, enjoyed the fun and endured the disappointments." Kelly said: "I volunteered to edit the magazine when it was first suggested, and the

association was glad to have me do so for a year in my spare time. After the first year I was persuaded to take on the job, full-time." Elinor Kingery has the last word:

"It was because of his dedication and enthusiams, his instinctive teaching abilities and his talent for instilling enthusiams in others that the organization was able to establish a magazine of value."

While George was editor — 1944-55 — no less than 82 major articles appeared in the magazine under his name. This does not count the dozens of editor's exhortations and pleas that he published, unsigned, to stimulate the readers to better gardening and active participation in horticultural affairs. His long article, "Low Shrubs for Colorado Landscaping," published originally in the October, 1948, *Green Thumb*, was found so important that it was reprinted in the Autumn, 1970, issue.

George Kelly was the first full-time horticulturist of Colorado Forestry and Horticulture Association — the man on the spot to answer all the gardening questions of the public, to direct and lead the field trips of the nature lovers, to identify the plants brought to the association, to be, it amounts to, an entire botanic gardens staff in himself. Kelly says this position was an opportunity to evangelize — to preach the gospel of adjusting gardening in Colorado to the state's unusual conditions. He wrote and talked and taught and became known throughout the region.

He worked, with others, toward the establishment of a botanic garden. He conducted the original gardening radio programs for Denver. He wrote a series of newspaper columns on gardening. He was a leader and active participant in the first plant sale and later in Denver's garden shows. He spread the word. He made a permanent mark on the history of horticulture in this region.

Perhaps the long-time members of CF&HA remember most vividly the field trips with George Kelly. Listening to their stories of these outings, one gets the impression that the presence of George



George W. Kelly, right, accepts the "Outstanding Nurseryman of 1965" award from Harry Swift.

Kelly made every trip to the wilds a never-to-be-forgotten adventure. He seems to have been up at all hours to see nature under the sun, by moonlight, at dawn and at sunset, and he allowed no fellow camper to escape his energetic exploring.

In 1951 Mrs. Augusta Amalie (Sue) Johnson, a widow working on the herbarium committee of the association, became Kelly's secretary at Horticulture House. She was a lively, accomplished horticulturist in her own right. It was natural, then, that these two would be married, which they were, on May 16, 1952. Since then, all references to Sue and George have been as "the Kellys."

The Men's Garden Clubs of America recognized George's productive career as a horticultural evangelist and supreme gardener when they presented the Johnny Appleseed award to him in 1954.

When Colorado Forestry and Horticulture Association merged into Denver Botanic Gardens in the early 1950's, George Kelly became the first acting director of the Gardens. In this position he felt somewhat restricted in his activities. It seems that the leadership conflicted with George's individualism. So, in 1955, George resigned and returned to his place in Littleton. In recording his resignation, the trustees

announced that he had been awarded an honorary life membership in the association.

The March, 1972, issue of *Colorado West* quotes Kelly as saying: "When they got too many directors and started telling me what to do and what not to do, I quit and started my own florist shop."

The florist shop George Kelly started after leaving Denver Botanic Gardens was the Cottonwood Garden Shop, on South Santa Fe Drive at Littleton. At once the thousands of gardeners and would-be gardeners who had been reading Kelly's books and articles and listening to his programs, flocked to the shop for help and advice and sometimes to buy plants.

George and Sue were in business. The phone rang constantly. Everyone wanted something from them. "I was the expert," George says, "but not a salesman." The Kellys didn't get rich. "They promoted choice and unusual plants for particular gardeners and offered sympathy and encouragement to the rest," says Bernice Petersen. She continues: "When he sold tamarisks — the feathery shrub with pinkish plumes — to a customer, he always delivered two; one he planted and cut back to the ground for the plant of the future, the other remained upright, for its first year at least, so his customer would see something for his money." Perhaps that's why they didn't get rich.

For ten years the Kellys operated the Cottonwood Garden Shop and then the call of the wild got to them. They wanted to get out in the open spaces and grow things, away from the insistent demands of business, so they went as far away from Denver as possible without leaving Colorado. They went to Cortez, and beyond, to McElmo Canyon, out in the Four Corners area. The Kellys purchased a hundred acres of McElmo Canyon land, just west of Moqui Point, and, in November, 1965, drove their camper across the sage and rabbit brush to the base of a high red cliff and stopped — at the site of their new home.

They are there now, at McElmo Canyon, except when they are answering the demands of the many friends who

want to see them and of the many organizations who want to hear them. They have built a home at the spot where their camper stopped in 1965, a low one-story, sand-colored structure with five rooms, a two-car garage and a huge patio. Electricity has been brought in, a well drilled, and a septic tank system installed. The home is modern and comfortable. The site is in a narrow valley, at an elevation of 5,480 feet, with good protection from bad weather.

East of the house, at the head of a small canyon, is "The Park" where George planted a half acre of wheat grass and a garden. There are 20 acres of irrigated farmland where he grows peach and apricot trees. He keeps on experimenting with plants and has tested over 75 different trees and shrubs, including a Japanese pagoda tree. Some 150 other plants are grown on the place and George has found new varieties in the canyon which he has brought to Harry Swift of Western Evergreen Co. for cultivation and distribution. At least a dozen new plants, not catalogued by Dr. Harrington, have been found in the McElmo Region by George Kelly.

Sue, of course, is growing roses there. They flourish with little trouble from insects or disease. However, it was necessary to build a wooden fence around the roses to keep out the deer, skunks, squirrels, porcupines and coons which also loved the greenery.

Always concerned with his community and always ready to get things going, George found he had to do something about the appearance of Cortez. In 1967 he prepared a master plan for beautification of the city and then directed the building of a rock garden and the planting of an avenue of trees in its park, the building of a fountain, which he designed, in its Main Street, and the placing of plant-filled center islands at the entrances to Cortez. Other Kelly projects included planter boxes on the downtown sidewalks, an outdoor theater designed like a cliff dwelling, and banks of roses put in by Sue.

Inevitably, when Cortez chose its first "man of the year," Kelly was the man.

He is not forgotten; the honors continue. In 1968 he was licensed by the Colorado Board of Landscape Architects on the basis of his reputation and experience, and in 1969 he was honored by the International Tree Conference for "sustained excellence" in publishing and editing horticultural articles.

As though developing his own property, testing trees and other plants, beautifying Cortez, and conducting a new garden program on the radio were not enough, George has delved, vigorously as always, into the new field (for him) of archeology.

The Kelly 100 acres lies in the heart of an ancient Indian homeland, quite heavily populated in the years between A.D. 1000 and 1250. An official count of 1,587 different ruins in the McElmo area was made by Dr. David Breternitz of the University of Colorado after his explorations of 1965-69. But George Kelly has explored the hills and canyons more thoroughly than anyone and estimates that the final count of the ruins will exceed 6,000.

He continues to explore and excavate the ruins of over 100 man-made towers scattered among the pinons of the dull red canyons, and the cliff houses, kivas and granaries in the arching sandstone caves. Over the years, curious wandering



Archaeological Study with the Kelly's.

visitors have picked over the ruins and vandals have shoved in the stone walls, but beneath the sand deposits of centuries Kelly is constantly finding a wealth of structures and artifacts. He has meticulously unearthed the buried walls of pueblos and excavated the ancient Indian kivas, some of which have been fully restored.

It is a whole new career for this curious, restless, vital man, in which, as usual, he is breaking new ground, making new discoveries, teaching the rest of us.

Says Kelly: "No one really knows much about this country. We've only scratched the surface. There's still so much to do, so much to learn."

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This article has been prepared from a personal interview with George Kelly, from personal papers of Bernice Petersen, from the files of *The Green Thumb*, and from the following published articles furnished by Bernice Petersen:

"George Kelly, apostle of beauty," by Zeke Scher in the February 8, 1970 issue of *Empire*, the magazine of The Denver Post.

"George Kelly was a rainbow chaiser," by Ed Otte, in the March 19, 1972 issue of *Colorado West*, the Sunday magazine of the Grand Junction Daily Sentinel.

"The Towers of McElmo Canyon," May-June 1972 in *Colorado* magazine.

Solange Huggins prepared a list of "Green Thumb Articles Written by George W. Kelly" which contains 103 separate articles appearing in that magazine, 21 of which were written after Mr. Kelly left Denver Botanic Gardens. Specific issues of *The Green Thumb* referred to in this story are: 1947, Vol. 4, No. 1 — p. 1; 1948, Vol. 5, No. 10 — p. 10; 1969, Vol. 26, No. 1 — p. 2; 1970, Vol. 27, No. 4 — p. 103; and 1972, Vol. 19, No. 3 — p. 82.

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FOCUS on

Psidium guajava

in the
Boettcher Memorial
Conservatory

Peg Hayward

Psidium guajava Linn., common guava, is native to lowland South America. It was apparently semidomesticated more than 2,000 years ago. *Psidium*, a genus of the *Myrtaceae* family, consists of about 140 species only two or three, principally *P. guajava*, which are of interest for their fruit. The Spanish conquistadores found the tree growing extensively from Columbia to Peru and they introduced it to other tropical countries. Today it is cultivated throughout the tropical world as well as in many sub-tropical climates.

The name guava is thought to be of Haitian origin from guayabo. *Psidium* from the Greek *psidion* is the Greek name for pomegranate. The fruit was thought to resemble the pomegranate because of the persistent calyx which remains on the apex of the fruit.

P. guajava is a small, open and low-branched evergreen tree up to 25 to 30 feet high with a rather slender trunk. The bark is very smooth and pale, greenish brown in color and tends to peel off in thin flakes. Leaves are oblong-elliptic or oval and commonly about 4 by 1½ inches. The margins are entire; the apex has a short point or may be blunt, and the base is rounded. They are light green, with a slight shine above but dull below. Often both surfaces are softly hairy, especially when young. The main veins are well spaced and distinctly raised below.

The guava bears attractive small white flowers which appear from spring to

midsummer, but usually when the tree is making new growth at the beginning of the season. Flowers which are about 3/4 to 1¼ inches wide are borne singly, or two or three together on axillary or lateral peduncles. There is a short green calyx with 2 to 4 lobes, 5 white separate petals, many white stamens with cream tips and 1 thin, white style. The flowers have a faint scent.

Guava fruit, a berry, varies considerably in its form from ovoid to globose or pyriform. It is commonly 1 to 3 inches long and it may be smooth or faintly grooved. Fruit is green at first, ripening to greenish or lemon yellow, or bright yellow flushed with pink. The aromatic pulp, which contains numerous small, bony seeds, may be white, yellow or pink. The texture and flavor also vary. The best have a slightly sweet flavor blended with muskiness and mild acidity, but some types may be too tart or too musky. The fruit is best when fully ripe and plucked fresh from the tree. It is damaged by rough handling or if it is allowed to fall to the ground. The fruit is wholly edible, the skins being papery and almost a part of the pulp. It is an excellent source of vitamin C and also of minerals such as calcium and phosphorus. Guava can be eaten fresh out of the hand, sliced and served with cream, made into drinks, stewed, or used in making pies, jelly and preserves.

In many tropical areas the guavas are given little cultural attention, but in

Florida, California, Cuba, and India orchards have been established and cultivars developed by selection and hybridization. Most commercial planting is still done from seed, though propagation of named types may be accomplished by air-layering, budding, or grafting.

P. cattleianum Sabin, strawberry guava native to Brazil, is also found in the Boettcher Memorial Conservatory collection. The strawberry guava is considerably more cold-resistant than the common

guava. The plant is usually seen as a bushy shrub, but sometimes it becomes a tree up to 25 feet high. Because of the attractive glossy, deep green foliage, the plant is often used in ornamental plantings. The small, round fruit, which is about half the size of the common guava is produced in abundance and ripens in September or October. The fruit with dark red skin and white flesh has a pleasant spicy flavor, somewhat strawberry-like.

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Psidium guajava

WEED CONTROL IN HOME GARDENS

Eugene Heikes

A weed is a plant growing where it is not wanted; this may include the plants we commonly associate as weeds, but it can also include bluegrass growing in a flowerbed, or volunteer tomatoes in a vegetable garden. Plants that compete with desirable plants for water, soil nutrients and sunlight, are classified as weeds. Also, many weeds harbor diseases and insects that may attack desirable plants.

There are three general methods of weed control that can be used in the home garden: (1) Cultivation and mechanical removal (hoeing, pulling, etc.); (2) mulching (smothering of weeds); and (3) herbicides (chemicals).

CULTIVATION AND MECHANICAL REMOVAL: This is the safest and most common method for controlling weeds in small home gardens. Since only these weeds that are actually present can be controlled mechanically, this process must be repeated several times through the summer to be effective. For small areas, hand-hoes or wheel-hoes are most practical, but for larger gardens (1/10 acre or larger), power equipment such as roto-tillers and garden type tractors will reduce much of the work and probably result in better maintenance and care of a garden. If power equipment is used, the garden should be layed out and planted so that this kind of equipment can be used. This means proper row spacing, planting arrangements, etc.

MULCHING: This controls weeds by preventing light from reaching the soil and preventing germination of seedlings. This will control most annual weeds (those that germinate from seed each year), but perennial weeds that regrow each year will probably not be controlled with mulching unless repeated for several years.



Sweet corn being grown under a paper mulch.



Sweet corn, left side grown in paper mulch, right side conventional tillage.

There are several methods of mulching that will control weeds, one of the most effective is the polyethelene or sheet plastic type mulches that can be spread between rows of vegetables or fruit crops. Paper and paper — polyethelene combinations can also be used. Black

polyethelene (black plastic), is preferable for home gardens because it prevents light from reaching the soil and germination of weed seeds. Edges of the plastic should be pressed down into furrows near the crop row and the edges covered with soil. The area around the vegetable plants will need to be carefully cultivated or hoed. Advantages of polyethelene mulching include moisture concentration, increased spring soil temperatures and prevention of weed growth. This is especially adaptable to strawberry plantings or between tomato plants and rows.

Most frequently used organic mulches include plant residue such as straw or hay, leaf and grass composts, wood products such as sawdust, wood chips and shavings, or animal manures. To prevent weed growth, these materials must be spread over the soil surface 4 to 6 inches deep, otherwise weeds will grow through them and be difficult to hoe or cultivate out. To apply these mulch materials requires considerable hand labor; most organic materials are bulky and difficult to spread evenly. However, this is not a serious problem for small gardens. Organic mulches return organic matter and some plant nutrients to the soil and improve soil tilth as they decompose. When organic materials are used for mulching and decompose, additional nitrogen fertilizer may be needed to prevent a deficiency of nitrogen in the soil during the years the mulch is decomposing.

HERBICIDES (chemicals): It is not a good practice to use herbicides in small ornamental and vegetable gardens that contain several crops, because different vegetable crops and flower species are tolerant of different herbicides, and weeds vary in their tolerance to herbicides. Also, some herbicides may remain in the soil longer than one growing season and may kill or injure some species the following year (especially if excessive rates are used). Ideally, a specific herbicide should be used for each crop species, but since most people have several crops in their gardens, it is impractical and expensive to

buy the several herbicides that would be needed. People using herbicides in gardens should understand the compound they are using and pay particular attention to the precautions printed on the label. Application methods must be carefully controlled when a herbicide is used in small areas. The tendency is most often to apply excessive amounts resulting in crop injury for one or several years. Applications must be accurate and uniform.

If a gardener is unwilling to remove weeds by hand or with mechanical equipment, there are several herbicides that can be used depending on the crop species involved. Dacthal or Terflan are probably the safest to use in these situations and are tolerant to several different vegetable crops. These herbicides may be sold under several trade names. If a gardener cannot identify the trade name on the container, look for the common name or chemical name on the label, such as DCPA or Dacthal and trifluralin for Terflan.

Dacthal is a preemergence herbicide that must be applied to weed-free soil. It controls weed seedlings soon after the seed germinates. The herbicide action is most effective if rainfall occurs or the soil is irrigated within two to three days after application of the herbicide. It is commonly used for annual grass control in lawns and can also be used on a number of flower species, strawberries and garden vegetable crops. Read the label carefully and do not use Dacthal on garden crops, ornamentals or flower plantings that are not mentioned on the label. A one-time application to all species is not possible in a garden or flowerbed, because some plants are susceptible to injury in early growth stages. It is preferable to use Dacthal at seeding or transplanting time; if this is not possible, the weeds should be removed and Dacthal applied to prevent further weed development. Dacthal is probably the best multi-purpose herbicide for home garden use.

Terflan is a good grass killer and is effective on some broadleaf weeds. It must be mechanically incorporated into the top 3" to 4" of soil using a rototiller

or similar equipment. Treflan can be purchased as a liquid with 4 pounds active ingredient per gallon, or in granular form which may be more convenient for small areas. Treflan can be used for weed control in beans, broccoli, cabbage, cauliflower, carrots, peppers, tomatoes, several fruit tree species, ornamental shrubs, and several vegetable crops and established

flowers.

If herbicides are handled and applied properly, they are safe, and will eliminate a lot of hand labor, but people should understand the chemical they are using, especially the precautions on the label, and use it precisely according to directions.

Books on WEEDS in

The Helen Fowler Library

Compiled by Solange Huggins

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Exotics of COLORADO



Common Purslane, *Portulaca oleracea* L.

Helen Marsh Zeiner

Those unwanted plants called weeds are ever with us, and one that has almost certainly plagued every home gardener is common purslane, *Portulaca oleracea* L.

Common purslane is an easily recognized annual weed. It is a prostrate or semi-prostrate plant with numerous branches spreading out to form mats. Branches may be as much as a foot long, so that mats are often large.

Stems and leaves are succulent or fleshy. The leaves are flat but thick, very small (only about $\frac{1}{4}$ inch long), and spatulate in shape, rounded at the apex or cut off squarely at the tip (truncate).

Numerous small, inconspicuous yellow flowers open only in sunshine, so that they often go unnoticed. Each flower produces many tiny black seeds.

Common purslane is also called

purslane, pursley, pussley, pusley, or wild portulaca. It is a member of the purslane family, *Portulacaceae*, a family which also contains some plants grown as ornamentals and some lovely wildflowers.

In the genus *Claytonia* we find spring beauty, one of the earliest wild flowers of the Colorado foothills, and the big-rooted or alpine spring beauty of higher elevations. The charming pygmy bitter-root, common in the montane, subalpine, and alpine zones of the Colorado mountains belongs to the genus *Lewisia*. In northern Colorado one can find *Lewisia rediviva* Pursh, the beautiful bitter-root which is Montana's state flower.

Rose-moss, *Portulaca grandiflora* Hook., is an old-fashioned colorful annual for sunny dry places. This attractive

cultivated plant and weedy common purslane belong to the same genus, *Portulaca*.

The genus name *Portulaca* is a very old Latin name. *Oleracea* means "like a garden vegetable" or "a garden herb used in cooking." The common name purslane seems to be a French corruption of the genus name.

Portulaca oleracea is thought to be a native of tropical and subtropical regions which has spread until it is found in almost all parts of the world. It is very common in the Mediterranean region and could easily have spread throughout Europe from this area. It was first recorded in England in 1582. Common purslane is now to be found in every part of the United States; it is generally believed that it was naturalized from Europe.

The characteristics which have enabled purslane to spread so widely are also the characteristics which make it such a pest. First, it produces enormous quantities of easily spread and highly viable seeds which sprout and take root readily in cultivated or otherwise disturbed soil. Secondly, its succulent nature makes it hard to kill. Although it is easy to uproot a mat, the plant dries out so slowly that seeds may mature on these pulled plants. Plants which have been pulled often take root again. Its succulence also makes purslane a very drought-resistant plant which can survive high temperatures and low rainfall.

The difficulty of eradicating this plant and its general "pesty" nature long ago gave rise to the expression "as mean as

pusley," used to describe some completely despicable person.

Purslane does have one redeeming feature — it is an edible plant. Some varieties are actually cultivated as food plants. Although *Portulaca oleracea* is widely used as a food plant, it has never been as popular in America as in some other parts of the world.

Its good qualities were recognized by sailors, who, when they had scurvy, sought purslane in any likely port because it would alleviate their ailment.

It is known that the American Indians ground the seeds of purslane and made them into mush or bread, and also ate the fleshy green stems and leaves. They sometimes dried purslane in the sun and stored it to be soaked and boiled when needed.

The young, tender shoots can be eaten raw, sometimes mixed with other salad greens. They have a slight sour taste. Young shoots can also be cooked as greens. They have a mucilaginous texture which can be overcome by mixing purslane with other greens. It has been suggested that the mucilaginous texture can be disguised if the shoots are chopped and mixed with a beaten egg and bread crumbs and baked or fried. Purslane can be used in much the same way as okra to thicken soups. The shoots can be made into pickles.

If common purslane keeps springing up in your garden in spite of your best efforts, why not try some of the above suggestions for preparing it for the table? You might decide purslane isn't such an objectionable nuisance after all.

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Note: Because *Portulaca oleracea* L. is so common and so widespread, almost any manual of wild plants or manual of weeds will contain information about this plant.

SUPPORTING ORGANIZATIONS

Remarks of Mrs. Moritz Milburn, Member of the Executive Committee of The Arboretum Foundation in Seattle, Washington on the occasion of The Western Regional Meeting of the American Association of Botanic Gardens and Arboreta, San Francisco, California, February 22, 1974.

I feel that the definition of the title of my talk, "supporting organizations" is extremely broad. In my interpretation, it includes every effort for support — be it from one individual or from groups of a few people, of hundreds or of thousands. It is extremely important to recognize that a botanic garden or arboretum has many different appeals to the public. There are those individuals who want to participate actively, those who want to learn, those who just want the pleasure of enjoyment, and those who want to share and give. Each type of involvement should be appreciated for its own worth, and any arboretum should have its program framed to encompass all aspects of these types of participation. It is basic to the concept of a botanic garden or arboretum that it survives to be of service, and that automatically means serving the public and the community.

Because I feel that my long association with both the Arboretum Foundation and the Seattle Garden Club has given me the opportunity to witness and participate in two different and extremely successful methods of support, I am going to give you an idea of their contributions to Seattle's University of Washington Arboretum over the 40 year period of its existence. In each case this encompasses the life span of the Arboretum in its present location in Washington Park. In 1936, when it was in its formative stage and little more than a dream, the Seattle Garden Club undertook to have a basic ground plan drawn for the placement of various plant families by the Olmstead Bros., firm of Landscape Design of Brookline, Massachusetts. Over the years that plan



has been followed except for a few changes due either to soil conditions or particular needs of specific plants. At the time the basic ground plan was made, the Seattle Garden Club accepted the responsibility of the development of Azalea Way which is a major feature of the Arboretum. The club had a detailed plan done for that particular area by the same firm, and that plan also was given to the Arboretum. This three-quarter mile grass walk which is bordered with Japanese cherries, eastern dogwoods, and many kinds of azaleas is a permanent project of the club. I am guessing that there will be at least another ten years of work to see this area fully developed. And there never

will be a time in the future when there won't be new varieties to be added and replacements to be made. From the earliest days, this club has maintained an active interest and participation — giving plants, special fertilizers, weed control chemicals and paying for plantings. And in recent years it has assisted in maintenance during the peak growing months. This club has a broad and diversified program, but the Arboretum will always be an important part of it. It has been a very happy relationship and one that I think would be well worth looking into for other arboreta or botanic gardens. A single club can assume responsibilities for a designated unit within the framework of a whole area very satisfactorily. And it can be a very rewarding experience for both.

Funds for the support of Azalea Way have been raised by a variety of projects, but all of them have been related to horticultural endeavor such as flower arrangement displays, plant sales and plant auctions. This is the accomplishment of a club of fewer than two hundred members. Over the years the director of the Arboretum has worked closely with their committees advising them of the greatest needs for the area and possibilities for future development. There have been other garden clubs that certainly could be mentioned, because their contributions have been substantial and extremely effective. I do want to mention two whose contributions in financial backing for plantings and plant collections and membership participation in weeding and maintenance have been outstanding over many years — the West Seattle Garden Club's involvement with the Woodland Garden and the Mercer Island Garden Club's long association with the Winter Garden. More recently the Northwest Ornamental Horticultural Society has made large general contributions of support — a large part of their program has been geared to educational programs open to public participation. Not being a member of any of these last mentioned organizations, I do not feel qualified in properly reporting for them.

Without any question, the largest supporting group for the University of Washington Arboretum is the Arboretum Foundation which was founded in 1935 with the express purpose of promoting, fostering and assisting in the establishment, development, growth and maintenance of the Arboretum. A small nucleus of dedicated citizens started the Foundation feeling that the University would need help in seeing such a development become an accomplishment. Presently the membership is nearing the 3,000 mark. It is a wonderfully active, strong organization that has had excellent leadership and fine community and state representation on its board. The thirty-six members of the Governing Board plus members of the Honorary Board (non-voting), meet four times a year, but the general business of the Foundation is carried on by the Executive Committee which meets alternate months and is made up of officers and committee chairmen. The Director of the Arboretum attends all regular Board meetings and generally there are one or more members of the College of Forest Resources faculty or staff to report on current events, projects or problems in Arboretum affairs. Sadly, we have been faced in the past few years with more problems than could ever have been anticipated, but in some ways I think the problems have even strengthened the Foundation. We do not want to lose the Arboretum.

This group has a Memorial Fund which has been a valuable source of income over the years. Ideally, distribution of these funds should be determined by needs for the area and should be in keeping with the University's intent for future development. For many years the Memorial Fund Committee planned specific plantings or individuals gave benches or drinking fountains, etc. But it has become clear that the University of Washington's Controlling Committee wants to have the final word in acceptance of such gifts and we need to broaden our memorial participation to conform to University policy and procedure in the future.

The Foundation is responsible for the

quarterly editing of the University of Washington Arboretum Bulletin which goes to all members and has a wide distribution throughout the world in exchange for other similar publications. The Editorial Committee is made up of Foundation members and faculty and staff of the University of Washington, and the publication certainly speaks for itself in quality. It is designed to be informative and educational with broad appeal for its horticulturally-minded readers. Recently, color has been added and the type set has been changed and we are proud of its up-to-date character. Thinking toward the future, it is possible that we might want to sell yearly subscriptions to this popular, informative quarterly for circulation throughout our state and the northwest area.

This past year the Foundation has been responsible for the publication of a book titled *The Long Road Travelled* by Dr. Henry Schmitz, an early professor in the College of Forestry and a past President of the University. Dr. Schmitz's untimely death left a manuscript that needed corrections and refinement, and the dedicated efforts of a few of our members made the book a reality. It is a fascinating history of the College of

Forestry and contains a chapter on the Arboretum giving in detail the only recorded account of the University's efforts in developing the Arboretum at its present location from its first days of existence to the time of his death.

Recently we subsidized the publication of Dr. Hitchcock's *Flora of the Pacific Northwest*; many of you surely are familiar with this fine work. Over the years we have been responsible for the distribution of many educational pamphlets, booklets and brochures, and this type of publication-is a project we will surely want to pursue in the future.

In June of 1972, the Foundation underwrote, planned and presented a symposium on *The Urban Arboretum in a Time of Crisis*. Representatives from related groups (city, county, state, national and university officials), directors of arboreta and concerned individuals were invited to attend and participate. This three day session was held on campus but gave all registrants an opportunity to be on the Arboretum grounds the final half day. Dr. Odegaard, President of the University, gave the welcoming address and said in his opening remarks, "I think that the action of the Arboretum Foundation in sponsoring this



particular symposium at this time is a very important one, certainly for us in Seattle. I suspect that the problems that we are encountering with reference to the Arboretum here are increasingly evident in many other parts of the country as urbanization continues apace with green space shrinking and population increasing. I suppose we have a classic group of the kinds of problems that arise. I would like to express appreciation to those who have come to Seattle from afar to offer their experience and their counsel at this particular time." He was referring to our distinguished and knowledgeable speakers from Canada, Los Angeles and Chicago. This was a most meaningful and well-timed contribution in public relations and understanding of difficult problems.

The unique feature of the Arboretum Foundation is the Foundation Unit Council which involves half the total membership. This group of fifteen hundred in their eighty individual units forms the hard core working and learning group of the organization. These are dedicated members of the Foundation who want to participate to the greatest extent as well as add to their horticultural knowledge. An integral part of the parent organization, no one may be a member of an Arboretum Unit who is not a member of the Foundation. The Council also meets four times a year with two representatives from each unit attending. The groups average a membership of twenty and meet eight or nine times a year, usually in private homes. One unit's efforts are exclusively channeled to participation with the Japanese Garden. One packages and catalogues reeds for worldwide distribution working under the direction of the Arboretum staff in the greenhouses, and one mounts and numbers slides for the permanent Arboretum collection. But, generally, the individual units form their own programs according to their own needs, usually incorporating a field trip and a fund raising project for the Arboretum.

Let me tell you briefly about a few of the Unit Council activities and I think you will be impressed with the scope and

success of their endeavors. One of their newest ventures and one that has had great impact is in the environmental educational field. Five years ago a few members went into the schools to acquaint elementary students with native plant material. Today, as requests for this program come from six school districts, it is obvious that the twelve "Arboretum Ladies" — so named by happy children — are a smashing success. As we look to the future, there is a need to train more volunteers for this project. The demonstrations are made informally with as much plant material as can be carried into the classroom — cones, berries, large branches, ferns, seedlings, and pieces of rotting logs — to give a picture of the woodland environment. The students come to the Arboretum or go on a field trip to one of our county forest camps with new awareness and happy ability to be able to identify more of their world.

Members of the Unit Council who work in their greenhouse on the Arboretum grounds are responsible for the propagation and distribution of unusual plant material not only to our membership but to the community at the time of the annual plant sale. Years ago, the original members who worked there were educated in the science and techniques of plant propagation by members of the staff. Now, our members are responsible for carrying on that very fine educational program. The greenhouse is used five full day sessions a month by five different crews of eight members. And units can arrange for propagation sessions with an experienced advisor assisting at other times. This is a self-supporting program. All the expenses for the operation of the greenhouse are more than covered by the sale of plant material with any balance in funds going to the Arboretum. The design of the structure makes demonstrations and lectures easy to handle, because the work space is separated from the greenhouse area. And we are pleased that the staff is using it for adult education courses sponsored by the University. Members of the staff are always alert for any maintenance problem we might encounter, and we are grateful

and appreciative of that.

The single biggest money raising project within the framework of the Foundation is the Annual Plant Sale which is directed by the United Council and assisted by members of the Foundation who are not active in unit work. Plans for future sales start with balancing of books on the last one. It is a cooperative venture involving up to four hundred workers and for the one and a half days of selling plus the day or more of set-up, it provides an unforgettable experience for both worker and buyer. I think I have been remiss in not mentioning previously that we have many men in our organization and their participation with all of the program is very strong. In units, as members of the Board, and as officers, they have shared the work, the pleasures and rewards of the activities at the Arboretum and are marvelous and indispensable help at the sale.

I have purposely mentioned service outlets for volunteer participation in the educational field and hours spent in assisting the staff in its important role. This type of assistance is quite different from that given to money raising activities. But it seems to me more important in developing knowledgeable appreciation of what a botanic garden or arboretum can mean to the individual as well as to a community.

You may have noticed that I have made no mention of contributions in dollar figures, and I have no plan to do so. One community varies from another in so many ways that the accomplishments of supporting groups will vary accordingly.

The future surely holds great challenges in education, research and

public service. New ways will be found to plan meaningful demonstrations of plant material. New subjects can be added to lecture series on topics such as local ecology, land management, soil problems and plant diseases. And there can be greater use of the television media to reach outlying areas. Certainly supporting groups will be able to make an extremely important contribution in this area in volunteer service and financial backing.

If I were able to make one lasting, thoughtful contribution to this important gathering it would be my personal reflections on how to face the future in our efforts of support. By this time, the value of supporting agencies is generally acknowledged. In our own case, it is perfectly fair to say that without outside help the Arboretum could not possibly be where it is today. But since the intrinsic value of the Arboretum has become recognized by our legislature and the community, our University is now able and hopeful of developing its potential. And it is the proper time for us to accept the maturity of this development. We are a supporting organization, not the directing and operating force. Over the long pull there has been very fine rapport with the officers and staff of the University. The only times of exception have been occasions when the supporting groups felt they were in a position to dictate policy. This cannot work and should not be attempted. Basic to any assisting group's thinking should be their understanding of their relationship with the directors of the institution. I feel sure that with that basic, mutual understanding our assistance will not only be gratefully and willingly received but actively sought.



THE LATCHSTRING IS OUT...

at the LOS ANGELES STATE
and COUNTY ARBORETUM



Avalonne Kosanke

All roads leading to the Los Angeles State and County Arboretum hail the passerby with beauty. Using the unusual to do the usual planting job is customary here. An example is the extensive planting of Arboretum introductions along Baldwin Avenue. This effectively transforms a maze of unsightly off-on freeway ramps into a spectacular stretch of highway.

The newly designed entrance brings visitors past the electric eye counter and Information Center directly into a provocative complex of horticultural displays and exhibits. The Demonstration Home Gardens invite exploration. Intriguing combinations of plants, patio and path surfaces, container and shade plants, outdoor furnishings and lighting stir the imagination. The latest addition is an area sparking ideas for townhouse and garden apartment dwellers. It is a favorite spot for art shows, displays and the Annual Membership Dinner.

The more serious gardener will gravitate to the Gardens for All Seasons to see the latest in vegetable and flower selections and growing techniques.

A short walk brings one to the four major orchid greenhouses, each supplying basically different growing conditions. The California Arboretum Foundation, Inc., has sponsored collecting trips to Central

and South America to augment this collection. There are many species from all over the world. Some are housed in satellite lathe and greenhouses. The *Paphiopedilum*, lady slipper type, are especially outstanding. There are always breathtaking specimens in the rotunda display case.

Just north of Peacock Pavillion stretches a comprehensive display of all the junipers available in the Los Angeles area nursery trade. Seeing them here in mature form makes selection for the home grounds easier. Planted in drifts among them is a similar collection of ground cover sedums. These provide a color and texture foil for the junipers.

Ground covers play a major role in California landscaping. At the Arboretum, the South African daisy and cape weed lead the parade of color in late winter and early spring. On their heels come verbenas, gazanias and ice plants which last well into summer. All provide neat, moisture-holding insulation for areas of easy maintenance. A new South African daisy, *Osteospermum fruticosum* 'Burgundy Mound', was the Arboretum's 30th plant introduction to the nursery trade.

Swift consuming fires and brutal mudslides are constant threats in Southern California. Arboretum researchers work ceaselessly on these problems. Ground covers must establish quickly, be low growing, succulent with high moisture content and have a minimum of woody material. Shrubs must be fire-resistant, well-established and a dense, continuous covering to be effective. *Atriplex halimus* and *Cistus ladaniferus* are highly recommended. Following a recent series of fires, the public requested over 15,000 Arboretum brochures on fire retardant plants.

The Research Laboratory Building is worth visiting; brings many projects under one roof. A few are studies on soil, oak root fungus, turfgrasses, aphids, smog resistance, tobacco mosaic and converting solid wastes into useful soil additives. All are relative to immediate or foreseeable needs of the community. They reflect the perceptive leadership of Francis Ching, Director, who has said, "We must serve the needs and functions of the community we live in."

The constant change, challenge and progress of the Arboretum require an administrative and working staff of over 130 persons. The Administrative Building is a hub for many activities. Upstairs the library and herbarium share space with offices. The herbarium is especially proud of its large Australian collection, and the 30,000 mounted and unmounted embryonic specimens. Library collections reflect the Arboretum's interests. They include botany, horticulture, history, ornithology, periodicals, serials and research. This library also serves the Descanso Gardens and the South Coast Botanic Gardens. Let's visit the History Section to learn of the land itself and a man who dared to dream of a beautiful California.

In his search to establish new missions, Father Juan Crespi came upon San Gabriel Valley July 30, 1769. He wrote of descending into a valley of live oaks and sycamores, grapes, blackberries and innumerable Castilean roses loaded with bloom. He told of the fine black earth, an arroyo of water, green marshes and banks covered with willow. San

Gabriel Mission was established on 13,000 acres of incomparable farmland.

Ownership passed from the King of Spain to the Mexican Nation in 1822. Soon after, anthropologist Hugh Reid, The Scotch Paisano, settled here to study the Indians of Shoshonean descent. He married one of them, Dona Victoria, and continued to learn from his wife about her people. As Church property passed into private ownership, the Mission Fathers urged Reid to file a claim for the land. Reluctantly he did so in 1839 as other claimants sought possession. Though it was years before clear title was granted, he proceeded at once to improve the land. In deference to his wife's fear of earthquakes, he built a one-story, corridors, flat-roofed, adobe brick house on a knoll near the lake. That he was innovative is proved by his extensive planting list preserved today in the Huntington Library.

A series of owners followed, each leaving his mark upon the land and upon the adobe residence. During the great drouth years, the lake shrank to a marsh. Cattle dropped like flies, plantings perished and the holdings dwindled.

In 1875, E. J. "Lucky" Baldwin, rich from holdings in the Comstock Lode, bought what remained of the Rancho Santa Anita. He moved into the adobe residence. Racing stables were established, a private track and deer park built. He imported peacocks and exotic plantings from all over the world to grace the restored lake. His vineyards, grainfields, fruit and nut orchards flourished. A winery, buttery and general store provided for all the needs of his ranch and three hotels, with enough left over for the open market.

In 1879 the coach barn was built with wrought iron fretwork, sliding doors, hay shoots and immaculate stalls. His fine horses fared better than their grooms who slept in the loft.

For his third wife, Jennie, Baldwin built the Queen Anne Cottage completed in 1881. It was a triumph of Victorian opulence: stained glass windows in every room, crystal chandeliers, gold-flecked marble fireplaces and resplendent furnishings bought first hand at the Philadelphia Centennial Exposition in 1876. After her death at 23, it became his guest house. "Lucky"



The Victorian styled Queen Anne Cottage

died in 1909, and the cottage along with all the building suffered from neglect, dry rot, termites and vandals.

It was 1936 when Harry Chandler, publisher of *Los Angeles Times*, purchased what was left for subdivision purposes.

The story must continue now from another history book. In spite of the special climate he noted in Southern California, Dr. Samuel Ayres saw the plantings in gardens and parkways were monotonous and drab. Except for a brief spring splash there was almost no color. He dreamed of a botanical garden or arboretum which might foster a change in this dismal landscape. In 1943, as a member of the Southern California Horticultural Institute, he urged that a committee be formed to investigate the feasibility of establishing an arboretum. When the motion had passed, Ayres found himself chairman of the Arboretum Committee. The search was on.

Years passed while many possible sites were studied and rejected. It was 1947 when by chance he accepted an invitation of friends to visit their newly purchased lot near Arcadia, and incidentally to picnic near the tropical lagoon on "Lucky" Baldwin's old ranch. Ayres had never heard of "Lucky", but he went. A real estate office perched on top of Tallac Knoll. The final acres were staked into lots. Ayres sensed at once it was a potential site for his arboretum. His committee swung into action. Mr. Chandler was persuaded to take the land off the market.

Months of complex negotiations ensued between State, Los Angeles County and the Arboretum Committee. It was finally agreed the State and County should purchase the land. The County would lease the land from the State with option to renew. Nine acres were designated a historical preserve. Eight objectives were drawn up:

1. A horticultural center for southern California providing facilities for the promotion of horticulture and floriculture, fostering more extensive and intelligent use of ornamental plants and trees to enhance the beauty of southern California's gardens, parks and parkways.
2. A center for introducing, testing and improving plants adaptable here.
3. A training center for gardeners, propagators, etc.
4. A center of research and scientific study collaborating with federal, state and county departments of agriculture; also maintaining a catalog of plants cultivated in southern California.
5. A horticultural library and herbarium.
6. A publication center for bulletins, books and pamphlets of horticultural, botanical and historical interest.
7. A preserve of early California buildings and authentic historical gardens.
8. A bird sanctuary.

With this guideline, the Los Angeles State and County Arboretum was at last a reality. Ayres' dream had come true. It is satisfying to note that Dr. Samuel Ayres, Jr., was given special recognition at the International Shade Tree Conference, Boston, 1973, for pioneering work in introducing many flowering trees into southern California through

the Arboretum.

Plantings of the 127 acres are basically divided into geographic areas. It is a lot of ground to cover, but the tram tour makes it easy. The Australian collection is especially large since the climate is compatible. If you thought all eucalyptus look alike, notice the variations in more than a hundred being test grown. This is the largest collection in the United States. Eucalyptus have good landscape, sound- and windbreak value. Three new ones have been introduced by the Arboretum.

Over near Tallac Knoll there's an herb garden you'll not want to miss. It includes a kitchen garden, herbs for landscaping, fragrance garden, a dipping well, cascading pool, rock garden and a small knot garden. Many of the herbs are harvested for herb products sold in the Gift Shop. The newest adjunct is the Brailled Scented Terrace where visitors walk along elbow-high walls forming a terrace. They are urged to pinch, press, pluck and sniff while exploring this special garden. Labels are in both Braille and Roman letters.

More than fifty species of viburnums vie for attention in the Asian Section. They vary from knee high to small trees, evergreen to deciduous, showy flowers to skimpy.

That inviting sound of cascading water is the new Meyberg Falls on Tallac Knoll. The upper bridge is a pleasant spot to view the pools. Waterlilies, lotus, duckweed and many water plants share these terraced ponds with waterfowl. The whole Arboretum is a bird sanctuary. Dogs and cats are controlled. Strict wildlife protection rules are enforced. With birds rating as the world's most effective insect control, the benefits are mutual. Two banding projects are underway and close records kept. More than 200 species have been seen including 14 on the rare or endangered list.

From the base of the falls, a delightful, natural looking stream meanders 1000 feet along its Swish-Crete bed to the Upper Lagoon where it is recirculated. Chinese chestnut, fringe tree, dogwood, magnolias and many more lend enchantment here. There are pleasant curves with unexpected surprises like a wildflower bed or flowering shrubs. The whole six-acre area has an air of quiet renewal.



School children on a guided field trip pass by a 176 foot tall eucalyptus tree planted 100 years ago.

*The
Aquatic
Garden*



Did you see the handsome canopy made by the carrot wood tree by the Youth Education Building? It was planted in 1950 and is 40 feet across. Only the branch tips have been cut to allow passage. It is a favorite classroom for young folks.

The best is yet to come. The Historical Section with Coach Barn, Queen Anne Cottage and the Hugo Reid Adobe is faithfully restored and planted with historical gardens in keeping. The latest addition is Baldwin's personal depot which was moved brick by brick and reconstructed on the Historical Site. A few vestiges of their owners remain in the plantings. That gnarled pomegranate hugging the Adobe's wall is



The Santa Fe-Santa Anita Train Depot

one of 40 Reid planted. The sturdy date palm leaning far over the lagoon was planted about 1865. The magnificent twin trunked eucalyptus rising 180 feet, tallest tree on the Arboretum grounds, was also planted then. A Mexican fan palm there, is about 120 feet tall, possibly the tallest *Washingtonia robusta* in the continental United States. It was planted by Baldwin in the 1880's. His ginkgos fringe the barn. Take a quick look at the collection of artifacts in the Coach Barn, and note the "splendiferous" tallyho in the washrack. "Lucky" had it specially built and it was on display at the Philadelphia Centennial. Walk around the veranda of the Queen Anne Cottage and peek in every window as you go. It is like a page from yesterday with everything complete to the fresh flowers on the tables. Members of Las Voluntarias take pride in caring for these buildings and their furnishings including an extensive collection of period costumes.

Sorry we have to leave so soon. There's been no chance to visit the Coffee Shop or Gift Shop. We've barely skimmed past innumerable interesting plantings. A return visit soon is a must!

The Arboretum is barely 26 years old, and nine million visitors have watched its progress, learned from its plantings, benefited from its services. That's eloquent proof the Los Angeles State and County Arboretum continues to meet its objectives and serve its community.

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WATER LILIES, An Interesting Addition To Your Garden



Janet L. Wingate

Although few plants can approach the water-lily in beauty or variety of color, many gardeners ignore them, thinking they lack an adequate pool or will encounter high costs or excess trouble. A water garden, like any garden requires care but it also offers several maintenance advantages for there is no need to hoe, stake, spray, dust or weed. With a minimum of cost and a little care and planning, a beautiful pool with a colorful assemblage of flowers can become a rewarding addition to any garden.

Most cultivated water-lilies belong to the genus *Nymphaea* of the aquatic family *Nymphaeaceae*. They are divided into 2 groups, hardy and tropical, with each category offering a large selection of cultivars. The hardy water-lilies are perennials with the flowers varying in size from 2 inches to over a foot in diameter. They come in every color except blue, are often fragrant and all bloom during the daytime. The tropical water-lilies are usually treated as annuals by most casual gardeners but can be kept viable indoors through the winter in damp sand. The tropical cultivars usually require a larger pool, more soil, more fertilizer, more sun and a water temperature above 70°F, but offer larger foliage and flowers, a wider

variety of colors and day or night blooming times with most day blooming plants being fragrant. The cultivar Margaret Mary is a miniature tropical blue water-lily which is ideal for miniature outdoor pools as well as indoor aquariums.

Sunken pools can be made in various ways. The best pool is constructed of reinforced concrete in a square or rectangular shape and is an easy, inexpensive pool to build and can be easily planted and maintained. Miniature pools can be made from wooden tubs, tanks or half-barrels. Metal tanks, wash tubs and kettles can also be effective sunken pools if the inside is coated with a rubber-base paint to prevent rust. Prefabricated plastic or metal pools are on the market in a variety of shapes and sizes which can be easily sunken into the ground by digging a hole to fit. Heavy plastic sheeting can be used to construct a pool or a kit of aluminum strips and polyethylene sheets can be acquired from a water-lily dealer. Anything that holds water is thus a potential water garden.

Soil and fertilizer are important factors. The soil should be a heavy garden soil free of sand, peatmoss or decomposed wood and the fertilizer can be well

decomposed cow manure or nontoxic water-lily fertilizer.

To plant, fill the container with damp soil covering the plant to the crown with 2 inches of sand over the soil to prevent the water from becoming muddy, then lower the pot into the pool. If you are planting directly into soil covering the bottom of a miniature pool, place 6-8 inches of fertilized soil covered with 1-2 inches of sand into the bottom of the container, covering the plant as suggested above, and fill with water to the desired level. Tropical water-lilies should be planted with the crown no more than 4-6 inches below the water surface, while the hardy type of water-lily may be planted with the crown as much as 8-10 inches below the water surface.

The location of the pool is important and should be located in an area that receives at least 5 hours of direct sunlight, with better blooming normally resulting if exposure exceeds 5 hours.

Goldfish are a good idea for any outdoor water garden to control mosquito larvae. Make sure the pool is made of a nontoxic substance or is purged to remove poisonous material.

The Denver Botanic Gardens began a water garden in the summer of 1973 and all water-lilies did extremely well, indicat-

ing the water temperature in Colorado becomes warm enough for tropical as well as hardy types. Even the huge South American water-lily *Victoria regia*, which can develop leaves to 6 feet in diameter, was successfully grown. The hardy *Nymphaea* cultivars grown at the Gardens were: Attraction, Chromatella, Gladstone, Gonnere, James Brydon, Lustrous, Newton, Pink Opal, Rose Arey, Sumptuosa and Sunrise. The tropical cultivars were: Afterglow, Alice Tricker, Aviator Pring, Bagdad, Bob Trickett, General Pershing, George T. Moore, Golden West, Joe Cutak, Mrs. Edwards Whitaker, Pink Platter and Red Flare. Three varieties of lotus (*Nelumbo*) were grown plus several other water plants. The Botanic Gardens will continue the water garden this summer and offer a short course on water-lily care in August.

An excellent water-lily dealer is the Three Springs Fisheries, Inc., Lilypons, Maryland, 42723. They have a wide and accurate selection of water plants. *Garden Pools, Water-lilies, and Goldfish* by G. L. Thomas, Jr. owner of the Three Springs Fisheries, is a good reference book for those seriously considering a water garden and can be found in the Helen Fowler Library.

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Botanic Gardens Guild

Terrace and Garden Tour — July 24, 1974

Lovely "in town" gardens, varying greatly in size and planting, will be visited on the Annual Garden Tour July 24 from ten in the morning until six in the evening. Cost: \$5.00. Refreshments will be served.

GARDENING FOR EXCITEMENT

Irene Mitchell

In spite of the current emphasis on low-maintenance gardens, nothing can take the place of a perennial flower garden.

Perennials are ideal for mountain country because there is a wide variety of hardy types that require a minimum of water. In climates with cool nights, such as ours, the flowers last considerably longer than they do in hot areas, and colors have an unusual clarity under the high altitude sun.

Lawns are pleasant and soothing (though certainly not low-maintenance in this area), but a perennial border is summer-long excitement, with something new happening every day.

When choosing perennials for your garden, the problem is not in finding enough good ones. The problem consists of narrowing down choices since most gardens do not have enough room to grow all the perennials that will thrive here. The important thing is to choose the proper perennial for the site.

In my own garden, there is a great variety of locales, including dry, sunny spots with poor soil, sunny spots with good soil, shady spots with poor soil, shady spots with good soil, well-drained sloping areas, and spots that become regular sinkholes when it rains. There is bloom throughout the garden from April to October.

For the dry sunny spots with poor soil, there are a surprising number of plants that bloom gloriously. If mulched, many can go as long as two weeks without watering.

Achillea 'Golden Plate' is the all-time drought resistant plant. It blooms from June until heavy frost and has attractive

foliage as well. I combine it with a blue-flowered hardy geranium (the true *Geranium*, not the florist's *Pelargonium*), the blue cup-like flowers of platycodon, the fiery orange pinwheels of gaillardia, and the clear blue of the peachleaf bellflower, *Campanula persicifolia*.

I find campanulas to be especially accommodating plants, growing nicely in dry, sunny or semi-shady spots. They seem to thrive, also, in slightly alkaline soils and are excellent for touches of clear blue in midsummer.

Other good perennials for dry, sunny spots are the bearded iris, dwarf iris, gypsophila, daylilies, candytuft, echinops (this one is armor-plated), erysimums (wallflowers), asters, shasta daisies, *Dianthus* of all types, *Centranthus* (red





valerian), *Kniphofia*, upright sedums, rudbeckias, potentillas, anthemis, alyssum, monarda, liatris, creeping phlox, lupine, erigeron (related to our native ones), oriental poppies and coreopsis. Some of these, such as the upright *Sedum* 'Indian Chief,' are so attractive all summer that it seems an unexpected bonus when they bloom beautifully too.

For sunny areas where soil has been improved somewhat, the choice is even more exciting. Peonies, especially the anemone-flowered types which do not need staking, are truly permanent and easily cared for once they are established. Mine receive no more than a weekly watering long enough to soak down to

the deep roots. A pre-bloom feeding with superphosphate guarantees quantities of flowers.

Every Rocky Mountain gardener should grow delphiniums. The 'Connecticut Yankee' variety is bushy and interesting, but the tall Pacific hybrid types can only be described as magnificent.

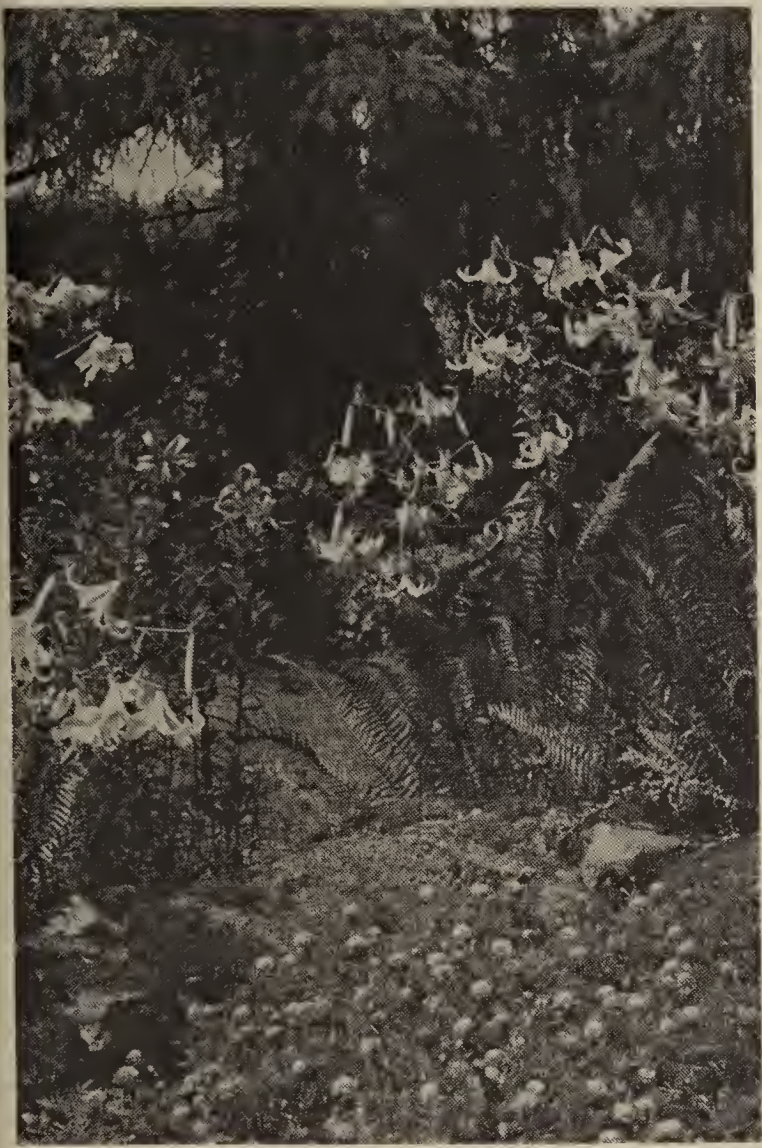
Where Eastern gardeners have to worry about frequently replacing these plants, they are truly perennial here, becoming more beautiful every year. They thrive on the same type of treatment given peonies.

Tall phlox, though they need yearly attention, are too glorious to leave out of the perennial garden. I avoid frequent dividing by pinching out all but the strongest shoots when they appear above ground in the spring. They need ample water so a good mulching helps.

Some others that do well where they can be watered weekly are the veronicas, fall-blooming helenium, early-blooming chrysanthemums, *Lychnis chalcedonica* (Maltese cross), pyrethrum, and heuchera.

Lilies are superb in a raised bed with good soil, especially the Mid-Century Hybrids, the oriental hybrids, and some of the trumpet types. 'Jamboree' and 'Pink Perfection' strains have bloomed profusely for me, though my favorite is





‘Thunderbolt’ whose apricot-colored blooms literally perfume the whole yard.

Sometimes one is faced with peculiar conditions, such as the dry, mostly shady, rocky area I have on one side of the house. Here I grow yellow alyssum in the one sunny corner. The shady spots are filled with the fern-leaved bleedingheart (*Dicentra eximia*); *Anchusa myosotidiflora* with its forget-me-not flowers, our native pale lavender Arizona valerian, mertensia, and the stunning deep blue flowers of *Aquilegia alpina*, a rare variety of columbine grown from seed.

Another dry, shady spot under a gigantic ponderosa pine holds hybrid columbines in all colors, polyanthus primroses, doronicum, hostas, campanulas, and native rue anemone. Since both of these areas are dominated by huge trees, they receive additional water and fertilizer when possible.

Near a small water-fall (man-made), on the shaded north side of the house, I grow candelabra primroses, native ferns, anchusa, bleedingheart (*Dicentra spectabilis*), violets, and the biennial canterbury bells. Since they require more

moisture, I have added ground bark to this small area which seems to keep the primroses in fine shape with minimal watering.

Many perennials are invaluable for backbone material in the garden as they thrive in either sun or semi-shade or even in spots that receive a half day of shade. Among these are the coreopsis, daylilies, dicentras, columbines, campanulas, and monarda.

Four points are essential in the care of the perennial garden: watering, feeding, mulching and division of plants when necessary.

For me, pine needles make the best mulch. They should be piled about 4 inches deep. A mulch is almost essential if you want to keep perennials in good condition with just a weekly watering during the hot, dry days of June. Watering should be thorough and deep, not frequent.

Spring care of a perennial garden consists of clean-up, broadcasting a mixture of balanced fertilizer (10-10-5) and triple superphosphate, about 2



pounds to 100 square feet. I also feed once in June and once in July with foliar plant food. After spreading fertilizer, I mulch. From then on, the main chores are staking and dead-heading to remove spent flowers. Bugs are dispatched with a rotenone-pyrethrum spray when necessary, though many of the rugged plants are bug-proof. I rarely use malathion, and nothing stronger.

With a little planning and attention to flowering times, a gardener can achieve artistic results with brilliant contrast of color and foliage through the summer.



Gifts and Bequests

Lifetime and testamentary gifts to the Denver Botanic Gardens are deductible in computing both income and death taxes. The Trustees ask anyone who wishes to add to the Gardens' limited resources to consider making a gift of either real or personal property during life, or a bequest or devise by will. Such disposition can be made specifically either for the Development Fund or the Endowment Fund or both. The proper designation of the recipient is *The Denver Botanic Gardens, Inc., a Colorado Corporation*.

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I hereby give ☐ bequeath ☐ to The Denver Botanic Gardens, Inc., a Colorado Corporation, a non-profit, educational institution, the following:

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THE COVER

Drawing of Japanese Garden

E. Bloustein

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The Green Thumb

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DR. C. EUGENE OSBORNE – EDITOR

FALL, 1974

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LOW SHRUBS FOR DRY LAND GARDENS

A. C. Hildreth *

For convenience in discussion, it seemed desirable to divide the shrubs suitable for dry land culture into three groups according to height — tall, medium-size and low. Tall shrubs were treated in the Spring 1971 issue of *The Green Thumb* and medium-size shrubs in the Autumn 1971 issue. The present article deals with low shrubs for dry land planting and arbitrarily sets their height as "below three feet".

In the discourses on tall and medium-size shrubs, the multiple purpose nature of these two shrub groups was emphasized. It was pointed out that in addition to their ornamental value, these shrubs serve many practical purposes in the garden. Such uses pertain mostly to protection, screening and delineation of property lines.

Several low shrubs are valuable as ornamentals, but bushes less than three feet high are too small for the practical purposes mentioned for the two taller shrub groups. Low shrubs, however, have their own special uses in the garden. Either sheared or informal, they are prized for edging borders and other plantings of taller shrubs, perennials and annuals.

Rows of low shrubs can be used to separate different areas of home grounds such as recreation space, vegetable garden and herb garden where taller barriers are not desired. Low shrubs constitute the main body of plantings in most rock gardens and recommended lists of ground cover plants nearly always include a

substantial number of low shrubs.

Under dry land conditions on the semi-arid plains, all woody plants must have certain physiological characteristics for survival. Specifically, they must be able to endure severe cold, to withstand prolonged drought and to tolerate alkaline soil. Low shrubs generally fare better than the taller species because of the protection afforded the low ones by winter snow cover.

In addition to survival ability, low shrubs must have desirable horticultural characteristics that make such plants worth growing in a dry land garden. Surprising as it may seem, good low shrub species for dry land gardens are not plentiful.

From the accumulated experiences of plains gardeners, nurserymen and research horticulturists it has been possible to compile a list of seven species of low shrubs which are specially adapted to dry land culture. They are also worthy horticultural subjects for a semi-arid environment. These species represent five different plant families.

1. *Amorpha canescens* Nutt. Lead-Plant. Member of the pea family, *Leguminosae*. Foliage silvery-white; summer blooming, flowers violet, attractive, borne on spikes which are densely crowded at the ends of branches; native from Michigan and Saskatchewan to Texas and New Mexico.

2. *Amorpha nana* Nutt. Dwarf Indigo Bush. Member of the pea family, *Leguminosae*. Similar in general appearance



Juniperus horizontalis

to *Amorpha fruticosa* but smaller. Summer blooming, flowers fragrant, violet, attractive, borne in single racemes. Native from Manitoba and Saskatchewan to Iowa and New Mexico.

3. *Atraphaxis buxifolia* (Bieb.) Jaub. & Spach. Member of the buckwheat family, *Polygonaceae*. Leaves with wavy margins; summer blooming, flowers pinkish, borne in small clusters, attractive. Native from Transcaucasia to Turkestan. A good rock garden plant.

4. *Artemisia frigida* Willd. Fringed Sage. Belongs to the composite family, *Compositae*. Decorative plant. Leaves finely divided and silvery. Flower heads small and yellowish. Plants aromatic, especially when wet. Transplants easily. Native from Texas to Minnesota, westward and northward to Alaska and the Yukon and also in Siberia.

5. *Caragana pygmaea* DC. Dwarf Russian Pea Tree. Member of the pea family, *Leguminosae*. Spring blooming; flowers yellow, borne singly. Dense shrub suitable for low hedges. Native in North West China and Siberia.

6. *Caryopteris mongholica* Bunge. Mongolian Bluebeard. Member of the vervain family, *Verbenaceae*. Leaves dull green above and whitish beneath. Late blooming; flowers blue. Native in North China and Mongolia. A good ground cover plant.

7. *Juniperus horizontalis* Moench. Creeping Juniper. Member of the cypress family, *Cupressaceae*. Evergreen shrub, fruits blue. Excellent ground cover plant. Native in Wyoming and Montana westward to British Columbia and eastward across the continent to Nova Scotia.

Among the wild plants of this species there is much variation. Some of the variants have been named and introduced into cultivation. For example, 'Andorra', 'Bar Harbor', 'Blue Rug' and 'Waukegan'. Of course there is opportunity for further worthwhile selections from native stands of this species, particularly from the western part of its range.

* *The Rocky Mountain News* kindly granted Dr. Hildreth permission to use his articles from that newspaper for republication in *The Green Thumb*. This courtesy is greatly appreciated. — Editor.

Macadamia ternifolia

in the
Boettcher Memorial
Conservatory

Peg Hayward

Macadamia ternifolia F. Muell., the macadamia or Queensland nut, was named in honor of Dr. John Macadam, Secretary of the Philosophical Institute, Victoria, Australia. The tree, which is a member of the *Proteaceae* family, is native to northeastern Australia. There are about ten species in the genus and most have a restricted distribution. *M. ternifolia*, best known, is cultivated for its edible fruit. This species was introduced from Australia into the Pacific islands less than a century ago, and especially in Hawaii where it has become the third largest crop behind pineapple and sugar cane. Macadamia trees have been cultivated to a small extent in California and Florida.

This evergreen tree becomes 50 to 60 feet high. The dark green, glabrous, shining leaves are oblong-lanceolate, from 3 to 12 inches long, usually in whorls of 3 or 4. The blade margins range from nearly smooth to serrate and prickly like holly. The inflorescence is a pendulous spike-like raceme about 5 inches long borne in leaf axils. A single raceme may bear from 1 to 100 small whitish flowers of which only 1 to 20 may set fruit.

The fruit is a follicle made up of a leathery pericarp enclosing a globular seed 1/2 to 1 inch in diameter with a

very hard durable seed coat. On maturity the exocarp splits and the shiny, light brown seed falls to the ground. For the fruit to become fully mature, about six to seven months is required from blossom. The spherical seeds are about the size of a walnut and superficially resemble a nut. The crisp, white, oily kernel has a distinctive sweetish flavor when eaten fresh which resembles that of a Brazil nut but is milder and more delicate. Processed, it ranks among the best of the confectionery nuts. After shelling, the nuts are dried with warm air, and then boiled in oil for several minutes before being salted and vacuum packed for export. The kernels contain about 75 percent oil and are a good source of vitamins and minerals.

Young trees may begin to bear when only three years old, however, the common age for bearing is seven years. Macadamia trees mature fruit occasionally twice a year, one crop appearing in April and May and the other in October and November. A mature tree may average 300 pounds of nuts annually. The main drawback in macadamia culture is the great hardness of the shell. They cannot be cracked satisfactorily with the usual type of hand nut crackers, because they slip out and roll away like marbles.

Improvised nut crackers can be made from vise-grip pliers, but in commercial practice they are cracked by power-driven nut-cracking machines. This disadvantage is being overcome somewhat by breeding thin-shelled strains.

Macadamia trees are propagated from seed. Freshly-fallen seed is preferred since the seed is oily, its viability is short lived and must be reasonably fresh to germinate. Propagation from cuttings is difficult, but semi-ripe stem cuttings in-

serted in a sandy mixture and placed in a closed case have a reasonable chance of success if proper care is given. This method is not used commercially. These trees grow and yield best in fairly rich soil in climates with abundant rainfall.

The close-grained reddish wood of the macadamia tree is considered valuable for cabinet work. The tree with its handsome holly-like foliage is worthy of being planted as an ornamental in parks and gardens.

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Macadamia ternifolia



THE PIED PIPER

Flo Middleton

Dr. E. H. Brunquist of the Denver Museum of Natural History has been conducting wild flower field trips for the Denver Botanic Gardens, bimonthly, during the growing season for plants, for many years. In this article one of his loyal followers and fellow students of nature spontaneously expresses her thoughts, feelings and reactions to participation in the field trips which have opened the door, for her, quite literally, to a world of enchantment.

This is Wednesday morning, the sun is shining, the clouds are white and fluffy. It's just about the kind of day Dr. Brunquist might have ordered. So you quickly pack your lunch, put on your hiking clothes and hiking shoes and meet at the Botanic Gardens House for another fascinating adventure studying wild flowers.

Dr. Brunquist is our Pied Piper. He carries a magic flute which touches our hearts for his knowledge flows from him like the clear continuous tones of a flute. He speaks of evolution and at times his knowledge is beyond us, but we maintain our composure by searching his ideas.

When we reach our area of study, we circle around and find we represent many areas of the United States and foreign countries as well. We also contemplate our reasons for coming together. We are still learning about nature and about ourselves. From Dr. Brunquist we learn that we are composed of matter and energy and we become a part of life by the courtesy of the sun. We learn an appreciation of our earth and its evolution by which earth became what it is today and its constant changing to being something different. We regard the earth as a whole and then become aware of her elements of rock, soil, water, atmosphere and living things.

We learn about fungi which are plants that lack chlorophyll and are unable to manufacture their own food. They live by digesting dead matter, saprophytes, or as parasites which feed on living organisms. Fungi are busy decomposing dead leaves, twigs, flowers, fruits, fallen trunks and animal remains and converting this forest debris into humus, which is an important constituent of forest soil and important source of nutrients for plant growth.

We learn about lichens. The fungi and algae develop a cooperative way of life. The fungi derives its food from the alga, while the moisture held by the fungus promotes the growth of the alga. Therefore the fungus can develop in places where it could not otherwise get food and the alga grows in areas that might otherwise be too dry for its development. So we look for lichens on the rock surfaces.

We learn that certain plant cells are able to use solar energy directly for the production of food from carbon dioxide and water. This we refer to as photosynthesis. Animals and man cannot do this and so we must have plants to eat or animals who feed on plants.

After our short discussion, we begin our search. Tall grasses at our feet, we advance upon nature, magnifying lens in hand, to appreciate her value and beauty. We might stop to examine a dandelion and find that it consists of many flowers.

We might examine a flower from the pea family (*Leguminosae*) and find that its petals consist of a banner, two wings and a keel. We'll investigate the locos and vetches to find their keels. The sharp keels belonging to the locos, the blunt keels to the vetches. We might look around and give notice to the insects, birds, wind and water which are necessary for pollination.

Many insects possess the ability to cause green plants to produce abnormal growths called galls. We find the galls on many plants. These insects could be wasps, flies or aphids. They insert their eggs in the tissue on which the larvae feed. The mechanical irritation produced by the feeding of the larvae or the chemical stimulation produced by their secretions causes abnormal cell growth.

We are often assisted by other experts such as Marjorie Shepherd, Dr. Helen Zeiner, Margaret Sikes and Dr. Gambill. Dr. Gambill's aesthetic sense might send us searching for the elves that are continually blowing the elfin 'fairy trumpet', gilia, *Ipomopsis aggregata* ssp. *candida*. If our perceptions were not clouded, well, who knows.

Some of our botanists are photographers, such as Mrs. Lorraine Yeatts of Golden, Colorado, and Lucian Long of Colorado Springs, Colorado. They refresh us with slides of the wild flowers during the winter months.

We learn plant families; we learn natural and medicinal values; we observe nature and listen to her sounds. These are priceless treasures which we should not lose sight of in this growing natural world.

Our field trip ends in mid-afternoon. The gaiety that prevailed throughout the day now slips into a quietness. Perhaps that quietness is the natural result of this communion with nature. Because it is in nature that we find ourselves again. Perhaps this is what the Pied Piper is trying to teach us.



Exotics of COLORADO

HANSEN PURPLE PLUM

Prunus cistena N.E. Hansen

Helen Marsh Zeiner

Plants with contrasting foliage add interest to a garden. The purpleleaf plums are popular shrubs and small trees for the home grounds because their purplish foliage contrasts so well with the green of other plantings.

Several varieties of purpleleaf plums can be found in Denver area gardens. Some are tall and tree-like, others are medium to tall shrubs. A shrubby purpleleaf plum frequently planted is Hansen purple plum, *Prunus cistena* N. E. Hansen. Hansen purple plum is also known as purpleleaf sand cherry.

The genus *Prunus* is a large genus in the rose family. Members of this genus are commonly known as stone fruits. The genus includes plums, apricots, almonds, peaches, and cherries. The native chokecherry of Colorado is *Prunus virginia* L.

Prunus cistena is an exotic of Colorado with a hybrid origin. It is the result of a cross between *Prunus pumila* L. and *Prunus cerasifera atropurpurea* Jaeg. *Prunus cistena* was developed before 1910 by Dr. Niles E. Hansen of the South Dakota Experiment Station. Dr. Hansen was trying to find a plum which would be an ornamental with colored foliage and which would also bear good fruits. *Prunus cistena* resulted from his experiments.

The parent plants used in the cross which produced *Prunus cistena* are in themselves of some interest.

One parent, *Prunus pumila*, the sand cherry, is native from New York to Illinois and Wisconsin. It is an upright tall shrub with reddish young branches. It has white flowers and purple-black scarcely edible fruit.

The other parent, *Prunus cerasifera atropurpurea*, the cherry plum, is a purple-leaved form with pinkish flowers and dark wine red sweet fruit. It was introduced into France about 1880 by M. Pissard, gardener to the Shah of Persia.

This plum was formerly known as *Prunus cerasifera pissardii* Bailey or *Prunus pissardii* Carr in honor of M. Pissard.

Prunus cistena shows some characteristics of each parent. It is a medium to tall shrub with purple-red leaves which hold their color well all summer. The young branches are also reddish.

The flowers are small and white with reddish pedicels and calyx. Although not in themselves showy, the flowers are pleasing because they are one of the very first flowers of spring and because they are very fragrant.

Fruits are blackish-purple and edible. However, fruits are not important in Colorado because the blooms come so early that freezing prevents fruit formation and only a very few plums are produced.

The colored foliage is the chief value of *Prunus cistena*. One shrub is usually used as an accent point among or against green-leaved shrubs. Sometimes Hansen purple plum is used as a hedge plant.

Hansen purple plum is conspicuous in the fall because the purplish leaves change to red. S. R. DeBoer once said of these red autumn leaves that when the sun shines through them "they look like thin membranes through which flows the clear blood of life."

One could no doubt list more outstanding exotic shrubs than *Prunus cistena*, but perhaps none more useful as a contrast shrub for this area.

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THE WYETH BOWL

The Wyeth Bowl has been presented to the Denver Botanic Gardens by Dr. John R. Durrance, Executive Committee member.

Dr. Durrance also contributed the custom-made stand and the trivet. The bowl is to be exhibited in the Helen Fowler Library.

This beautiful Wyeth Bowl is being dedicated by its donor to the following dedicated and public-spirited Denver women whose hard work, determination and zeal in large measure helped to bring about the establishment of the Denver Botanic Gardens in 1951:

MRS. ALEXANDER L. BARBOUR

MRS. JOHN EVANS

MRS. GEORGE H. GARREY

MRS. EDWARD H. HONNEN

MRS. HENRY B. McLISTER

MRS. JAMES J. WARING

The following information from the Franklin Mint describes the Andrew Wyeth work:

“His exquisite design for ‘The Wyeth Bowl’ was inspired by a visit to his father’s apple orchard, where the sight of laden apple boughs suggested a work rich with the natural colors of ripening fruit.

As the medium for this unique and original work of art, Wyeth chose English bone china. Since this was to be the artist’s first work in this medium, one of the world’s most renowned makers of fine bone china, Royal Doulton of Stoke-on-Trent, Staffordshire, England, was selected to produce it.

With painstaking care, the craftsmen of Royal Doulton set about the long process of matching each gradation and shade of The Wyeth Bowl to the artist’s exacting specifications — always striving for absolute fidelity to the delicate tonal values of Wyeth’s palette. The result of their work, Wyeth said, ‘delighted me — it made me truly proud.’ ”



ASSISTANT DIRECTOR KNAUER MOVES TO BAYARD CUTTING ARBORETUM

William G. Gambill, Jr.

Andrew R. Knauer, Assistant Director of the Denver Botanic Gardens since September, 1969, accepted the position of Director of the Bayard Cutting Arboretum on Long Island, effective July 15, 1974. During the first nine months of his tenure in Denver he served as Acting Director after the departure of Dr. Louis Martin, Director from 1966 until 1969.

"Andy", as everyone knows him, once told the writer that he originally accepted the position with the Denver Botanic Gardens because he was truly impressed with the new landscaping plan commissioned by the Trustees from the firm of Eckbo, Dean, Austin & Williams. He explained that he was anxious to have a part in bringing the new garden into existence. During his time in Denver he was able to realize a significant portion of that ambition. His experience and knowledge in horticultural construction and landscaping proved valuable in bringing the Denver Botanic Gardens nearly to the halfway point in implementing the handsome new plan. Andy also had a keen interest and wide knowledge of trees and shrubs which found expression in the east half of the new garden. His interest in the introduction of new or basically untried woody plants in the Denver area led to the development of the propagation area along the north boundary of the Botanic Gardens. Here heated and cold outdoor propagation frames, some equipped with mist systems, and trial beds for well-rooted specimens contain hundreds of plants which will be placed in the garden later or used in exchange with other gardens and nurseries. Andy left his mark on the Gardens, indeed, and the Trustees and Staff take

this opportunity to wish him well in his new position.

He will be getting back to a part of the country which is familiar to him. He is a native of Ohio, and before coming to Denver served as Park Horticulturist at Mill Creek Park in Youngstown, Ohio, and as Horticulturist-supervisor at Kingwood Center in Mansfield, Ohio.

Since many Coloradans are not acquainted with the Bayard Cutting Arboretum, some facts about this very interesting institution will be included here. In 1936 Mrs. Bayard James gave to the State of New York her estate known as "Westbrook", now the Bayard Cutting Arboretum, in memory of her father, W. Bayard Cutting. A very generous endowment fund for the Arboretum was established at that time by Mrs. W. Bayard Cutting. The Arboretum is situated on Great River, Town of Islip, Suffolk County, and administered by the Long Island State Park Commission under a Board of Trustees of the Bayard Cutting Arboretum.

The purpose of the Arboretum as expressed in the deed of gift is "to serve as an oasis of beauty and quiet so that said premises may be a source of pleasure, rest and refreshment to those who delight in out-door beauty; and to serve to bring about greater understanding on the part of both the general public and all those professionally concerned with landscape design of the value and importance of informal planting, and thus to be an influence in preserving the amenities of our native landscape."

W. Bayard Cutting purchased the original tract of 643 acres in 1881 and its development started in 1887 in accordance with plans made by the late Frederick Law Olmsted and carried forward by Mr.

Fred Sparks. The Arboretum is a most unique area for it is both a cultivated botanical garden, rich in the trees, plants and shrubs that have been imported from all over the world, and a wild life preserve, where the native woodlands and streams abound in typical flora and fauna indigenous to the Atlantic Coastal Plain.

Mr. Cutting brought to this country fine specimens of coniferous evergreens from all parts of the world, many from England, and from the Chinese specimens introduced by Ernest H. Wilson. Among the major plant groups are representatives of the following genera: *Abies* (fir), *Cedrus* (true cedar), *Chamaecyparis* (white cedar), *Laris* (larch), *Picea* (spruce), *Pinus* (pine), *Pseudolarix* (Golden larch), *Rhododendron* (rhododendron azalea), *Taxus* (yes), *Thuja* (arbor-vitae), and *Tsuga* (hemlock). Many bulb plants and wild flowers flourish in the Arboretum.

In summary, the Arboretum contains five well-marked nature trails, an out-

standing collection of very large, mature conifers, rhododendrons, flowering trees, and wild flowers. At this point, it should be mentioned that Mr. Knauer takes a greater delight in members of the genus *Rhododendron* than in any other group of plants! It would appear that he has become located in a veritable paradise of woody plants. The Arboretum is also becoming well known in its area as an important bird sanctuary.

The Arboretum produces a publication, *The Bayard Cutting Arboretum*, containing 66-year growth records of 27 conifers, each year.

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Andy Knauer demonstrates.

**A RESOLUTION IN MEMORY
OF
MRS. GLADYS CHEESMAN EVANS**

WHEREAS, Mrs. Gladys Cheesman Evans was a founder and long-time president of the Colorado Forestry and Horticulture Association, the predecessor association of Denver Botanic Gardens, and also was a founder, trustee, and president for many years of Denver Botanic Gardens, and

WHEREAS, her continued interest and service to Denver Botanic Gardens, Inc. and to numerous other civic and cultural endeavors of this city have come to an end with her death on May 20, 1974,

NOW THEREFORE BE IT RESOLVED that we will hold in long remembrance the outstanding services of Mrs. Gladys Cheesman Evans to Denver Botanic Gardens, who as President of the Colorado Forestry and Horticultural Association was steadfast in her determination to establish a Botanic Garden in this area.

Surmounting many difficulties her desire was fulfilled through the generous gift to the City of Denver of a detailed plan for a Botanic Garden in City Park by herself and her husband, John Evans.

As President of the Board of Trustees of the newly established Gardens she is largely responsible for its organization.

BE IT FURTHER RESOLVED that we pay fitting tribute to a distinguished citizen by inscribing this Resolution as a permanent part of the minutes of Denver Botanic Gardens, Inc. and forwarding a copy to the members of her family.

For the Board of Trustees

By John C. Mitchell
President

May 28, 1974

MRS. GLADYS CHEESMAN EVANS

In the brief history of this western country we come to value those staunch people who have had the vision and the fortitude to journey down the long and dusty road to accomplishment.

Mrs. John Evans was one of these.

As a native of Colorado she was acutely aware of the many problems confronting life in this area — its vast terrain, its widely differing climatic conditions from plain to mountain, and its lack of moisture.

Her qualities of leadership were at once evident when she became president of a small group of like-minded citizens in the Colorado Forestry and Horticulture Association. In providing attractive headquarters she brought the group together in a unique fellowship.

Her business acumen was unquestioned. Her vision was broad and her courage matchless. Under her direction, through years of frustration and disappointment, this intrepid fellowship remained steadfast in its aim — a Botanic Garden in this region.

An impasse was reached when it became evident that private funds alone could not bear the financial burden of such a garden. It was then that Mr. and Mrs. John Evans offered a solution. They would personally assume the cost of having an architectural plan made for a Botanic Garden in Denver's City Park. This plan would then be presented to the City with a suggested contract for its implementation through a combination of private and public funds under the management of an unpaid Board of Trustees.

The plan, drawn by S. R. DeBoer, was made and accepted by the City. A board of trustees was appointed and a corporation was formed in accordance with Colorado statutes. Mrs. Evans became its president.

Work began. A collection of French hybrid lilacs donated by Milton Keegan was followed by S. R. DeBoer's group of flowering crabapples, LeMoine Bechtold's iris and day lilies, Robert C. More's distinguished collection of evergreens and roses from the Denver Rose Society. These remain.

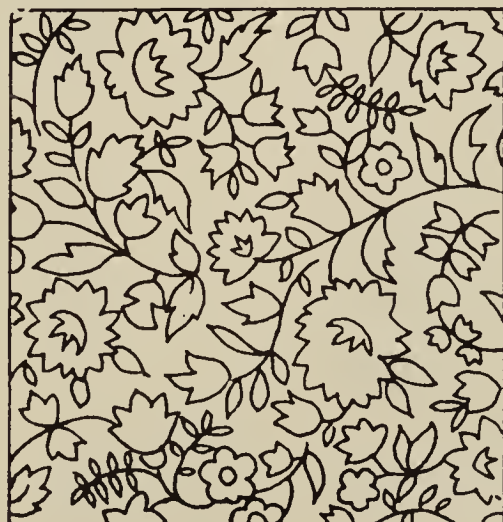
The subsequent necessity to abandon this original plan and to remove the Gardens' headquarters and its collection of smaller plants to a highly protected unit of the Gardens remains a sad comment on our troubled times.

§ § § § § § §

A remembered past illumines the future.

We pay tribute to a leader, now gone. Gladys Evans — one who knew the enlightened hour.

Anna R. Garrey



NETHERLANDS FLOWER-BULB INSTITUTE

1974 MINOR BULB STUDY

Janet L. Wingate

The Netherlands Flower-bulb Institute, New York, chose the Denver Botanic Gardens, Cantigny War Memorial Gardens in Illinois, Strybing Arboretum and Botanical Gardens in San Francisco, and Michigan State University as sites for the 1974 study of minor (small) bulbs developed by Freriks and Company, Hillegom, Holland.

Twenty-three DBG volunteers planted 15,727 bulbs representing 16 genera during October, 1974. (The term *bulb* is used here as a general horticultural term encompassing corms and tubers as well as true bulbs.) Flowering began during February of 1974, and continued into July, and data taken during this period consisted of the average date of emergence, date of first plant flowering, flower color, date of 50 percent flowering, percent of plants flowering, date planting was no longer showy, span of flowering in days (determined by subtracting the date of first plant

flowering from the date the planting was no longer showy), number of flowers per bulb, average diameter and length of flower, average total plant height, strength of plant, and a general rating based on the above data (see accompanying chart). Most species did well but data from additional years is needed for accurate judgement of suitability to our climate; therefore, the study will be continued at the Denver Botanic Gardens next year.

Minor bulbs require relatively little care. They can be planted from late September to mid-October and will do best in good garden soil which is not too moist, with good drainage of prime importance. Most minor bulbs should be planted at a depth of 2 - 4 inches, depending on the species, with larger bulbs requiring from 5 - 6 inches. Spring foliage must mature after flowering to insure a well developed bulb for the next year. Several books on bulbs can be found in the Helen Fowler Library.

Selected Data from the 1974 Minor Bulb Study

(Rating: 1 excellent, 2 good, 3 fair, 4 poor)

Species	No. Bulbs Planted	Color	% Flowering	Month or Months in which Flowering Occurred	Flowering Span in Days (Avg.)	General Rating
Amaryllidaceae						
<i>Allium</i>						
<i>A. aflatunense</i>	95	purple	100	April - May	16	2
<i>A. albopilosum</i>	90	violet	100	May - June	—	2
<i>A. caeruleum</i>	800	blue	62	May - June	31	3
<i>A. karataviense</i>	75	lt. pink	100	May	14	2
<i>A. moly</i>	825	yellow	98	May - June	20	2
<i>A. ostrowskianum</i>	375	rose	100	May - June	22	2
<i>Ixiolirion</i>						
Lily of the Altai						
<i>I. tataricum</i>						

Netherlands Minor Bulb Chart (continued)

Ixiolirion
Lily of the Altai

<i>I. tataricum</i>	625	blue	97	May - June	21	2
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Narcissus
Daffodil
Jonquil

<i>N. 'Baby Moon'</i>	200	yellow	63	April - May	16	3
<i>N. 'Peeping Tom'</i>	105	yellow	100	April - May	29	2
<i>N. 'W. P. Milner'</i>	50	lt. yellow	100	April	17	2
<i>N. cyclamineus</i>	40	yellow	100	April	19	2
'February Gold'						
<i>N. jonquilla</i>	680	yellow	100	March - May	33	2
<i>N. triandrus</i> 'Thalia'	55	lt. yellow	100	April - May	13	2

Iridaceae

Crocus

<i>C. 'Flavus'</i>	150	yellow- orange	100	March - April	41	1
<i>C. 'Flower Record'</i>	45	violet	100	March - April	32	2
<i>C. 'Peter Pan'</i>	40	white	100	March - April	35	2
<i>C. 'Pickwick'</i>	80	lilac stripe	100	March	17	2
<i>C. 'Victor Hugo'</i>	35	violet	100	March - April	31	2
<i>C. chrysanthus</i> 'Advance'	50	lt. yellow	100	March - April	38	2
<i>C. chrysanthus</i> 'Blue Pearl'	40	lt. blue	100	March - April	35	2
<i>C. chrysanthus</i> 'E.P. Bowles'	140	lt. yellow	100	February - March	34	2
<i>C. chrysanthus</i> 'Fusco Tinctus'	160	yellow	100	March	27	2
<i>C. chrysanthus</i> 'Moonlight'	175	lt. yellow	100	March	24	2
<i>C. chrysanthus</i> 'Snowbunting'	175	white	100	February - March	24	2
<i>C. chrysanthus</i> 'Warley White'	175	white	100	March - April	27	2
<i>C. chrysanthus</i>	140	gold	100	March - April	33	2
'Zwanenburg Bronze'						
<i>C. chrysanthus</i> (mixed)	150	mixed	100	March - April	36	2
<i>C. sieberi</i>	160	lt. lavender	80	March - April	25	2
<i>C. tomasinianus</i>	225	purple	100	March - April	27	3
'Whitewell Purple'						
<i>C. tomasinianus</i> 'Barr Purple'	285	lt. purple	100	March - April	21	2
<i>C. vernus</i> 'Vanguard'	100	lt. lavender	100	March - April	35	2

Iris

<i>I. danfordiae</i>	250	yellow	100	February - March	15	1-2
<i>I. histrioides</i> var. <i>major</i>	140	blue-violet	96	February - March	13	2
<i>I. reticulata</i>	75	dr. violet	90	March - April	11	2
<i>I. reticulata</i> 'Harmony'	50	dr. blue	100	March - April	17	2
<i>I. reticulata</i> 'Joyce'	40	blue	100	March - April	15	2
<i>I. reticulata</i> 'J.S. Dijt'	40	purple	100	March - April	17	2
<i>I. reticulata</i> 'Violet Beauty'	160	violet	90	March - April	19	2
<i>I. xiphioides</i> 'Duchess of York'	60	blue	97	June	13	2
<i>I. xiphioides</i> 'Isabella'	95	lt. blue	45	June	14	3-4
<i>I. xiphioides</i> 'King of the Blues'	40	blue	—	May - June	—	3
<i>I. xiphioides</i> 'Mansfield'	110	blue-violet	97	June	10	2
<i>I. xiphioides</i>	60	blue	56	June	8	3
'Queen of the Blues'						

Liliaceae

Brodiaea

<i>B. 'Queen Fabiola'</i>	340	lt. blue	100	June	20	2
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Chionodoxa
Glory of the Snow

<i>C. caerulea</i>	175	lt. blue	75	March - April	27	2-3
<i>C. luciliae</i> f. <i>gigantea</i>	225	lt. blue	85	March - April	36	2-3
<i>C. luciliae</i> f. <i>tmolusii</i>	250	blue	37	March - April	28	3-4
<i>C. sardensis</i>	450	blue	100	March - April	30	2

Netherlands Minor Bulb Chart (continued)

Erythroni.

Dogtooth Violet

Erythronium

Dogtooth Violet

<i>E.</i> 'Pagoda'	150	yellow	4	April	—	4
<i>E.</i> 'White Beauty'	200	lt. yellow	13	April - May	10	4

Fritillaria

Crown Imperial

<i>F. imperialis</i> 'Aurora'	8	orange	100	April - May	9	2
<i>F. imperialis</i> var. <i>lutea</i>	6	yellow	100	April - May	12	2
<i>F. imperialis</i> 'Rubra Maxima'	3	orange	100	April - May	10	2

Hyacinthus

Hyacinth

<i>H. amethystinus</i> (mixed)	850	blue, white	—	April - May	—	—
<i>H. azureus</i>	150	lt. blue	100	April - May	44	2

Muscari

Grape Hyacinth

<i>M.</i> 'Early Giant'	100	blue	48	April - May	24	3
<i>M.</i> 'Blue Spike'	275	blue	91	April - May	20	2
<i>M. botryoides</i> var. <i>album</i>	150	white	100	April - May	22	2

Ornithogalum

Star-of-Bethlehem

<i>O. umbellatum</i>	675	white	95	April - May	16	2
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Puschkinia

Lebanon Squill

<i>P. scilloides</i> var. <i>libanotica</i>	325	white	100	March - April	28	2
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Scilla

Squill

<i>S. hispanica</i> (blue)	425	blue	9	May	14	4
<i>S. hispanica</i> (pink)	295	pink	52	May	13	4
<i>S. hispanica</i> (white)	245	white	15	May - April	14	4
<i>S. sibirica</i> 'Spring Beauty'	250	blue	100	March - April	29	2
<i>S. tubergeniana</i>	175	lt. blue	100	March - April	24	2

Ranunculaceae

Anemone

Windflower

<i>A. blanda</i> 'Radar'	290	rose	37	March - April	31	4
<i>A. blanda</i> 'Rosea'	405	lt. rose	63	February - April	32	3
<i>A. blanda</i> 'Super Mixed'	740	mixed	31	March - April	34	3-4
<i>A. blanda</i> 'White Splendour'	335	white	100	March - May	36	1

Eranthis

Winter Aconite

<i>E. hyemalis</i>	775	yellow	31	February - March	20	3-4
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References

Crockett, James Underwood and the Editors of Time-Life Books. *Bulbs: The Time-Life Encyclopedia of Gardening*. New York: Time-Life Books, 1971. 160 p.

Genders, Roy. *Bulbs: A Complete Handbook of Bulbs, Corms and Tubers*. New York: Bobbs-Merrill Co., 1973. 622 p.

Mile, Bebe. *The Wonderful World of Bulbs*. Princeton, New Jersey: D. Van Nostrand Co., 1963. 348 p.

1"

BULB PLANTING CHART

2"

Numbers in parentheses refer to minimum spacing

3"

4"

5"

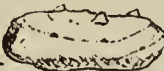
6"

7"

8"

9"

10"



Crocus
(4")



Squill
(4")



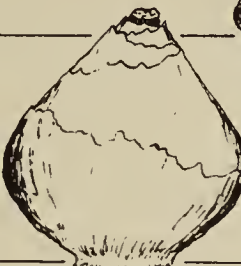
Glory-of-the-Snow
(3")



Snowdrop
(3")



Grape-hyacinth
(3"-4")



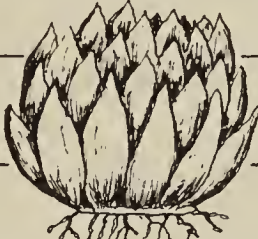
Hyacinth
(6"-8")



Autumn Crocus
(Colchicum)
(4")

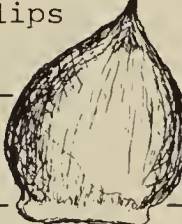


Bulbous Iris
(4"-5")

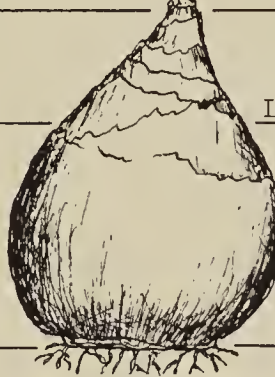


Lily (base-rooting)
(8"-12")

Early Tulips
(6")



Late Tulips
(6"-8")



Narcissus (Daffodil)
(6"-8")



Lily (stem-rooting)
(8"-12")

J.R. Feucht

Planting depths shown above are for well-drained soils. Bulbs do best in a sandy, clay loam. In heavier soils, plant 1"-2" more shallow.

A PRIVILEGE

Al Shea

To learn about the hundreds of tropical and semi-tropical plants living at the Boettcher Memorial Conservatory and to share the knowledge with others is a privilege. If one has a desire to become acquainted with plants of a different climate, an ideal learning opportunity awaits at Denver Botanic Gardens. Once one has gained an understanding of these exotics, the pleasure is doubled by guiding others into the world of plants. This enthusiastic sharer of tropical plant lore is a tour guide. The guide's responsibility is to show and describe the tropical plant life in a way that is both understandable and interesting. Spurred on by communicating his knowledge, the lecture-guide continues to learn more about the tropicals.

With such an opportunity and inspiration the tour guide begins to build an understanding of these warm climate plants. The man or woman guide learns about the life cycle of each plant, discovers the value of the plant to mankind, sees the ingenuity of man. For example, the chaulmoogra oil tree has provided man with a medicine to fight leprosy. The African Bushman tree offers man a fatal poison. The coconut palm provides food, sugar, cooking oil and material for rope and roofing.

Taxonomy or classification needs to be explained to tour groups. In the classification of plants a guide can go into scientific depth or he may simply present basic characteristics. Usually sufficient is a description of leaves, flowers

and fruit. When a guide presents information concerning the plant's life cycle, its relationship to man, basic taxonomy and one or two unique features, he is sharing much with attentive listeners.

The personal advantages of becoming a guide make the effort worthwhile. I can state from experience that travel is enhanced by botanical knowledge. Hawaii, South America, the Caribbean, offer extra delight when one sees the conservatory plants in their real life environment. The comprehension of the various ways in which plants are related comes from guiding. The conservatory guide begins to see the organized, vast world of tropical plants. During a year's time he observes the plant's changes. He sees horticultural practices of artificial lighting, plant surgery and plant propagation. Exposed to these techniques the guide develops and the benefits are invaluable.

Being a tour guide is challenging and filled with enjoyment. An ever expanding outlook enables the tour leader to add new information to his lectures. Novelty of presentation insures against his boredom from repetition. There is an expression at Denver Botanic Gardens, "The conservatory contains a world of ever-changing tropical plants." A guide needs to be aware of these changes and capable of describing them.

With determination and effort to learn, difficulties vanish; guiding becomes a pleasure and a privilege. This guide guarantees it's worth a try!

JAPANESE GARDEN TOUR

Atwell

Mrs. ~~Atherll~~ Gilman

The subject of this paper, "Japanese Gardens," came as the result of an offer of a trip to Japan co-sponsored by the Denver Botanic Gardens and Denver Art Museum. The trip was too good to turn down and it provided a chance to see the Far East and the material to write a paper on an art form about which I was completely ignorant.

Our first introduction to Japan came late one evening while driving to the hotel from the airport. We were confronted by a modern high-rise city aglow with a blazing, whizzing kaleidoscope of surrealistic neon lights. Terrified that there could be no gardens in this atmosphere, and therefore no paper, I was relieved to find that the gardens were only hidden by the dark and on our subsequent tours around the city it became apparent that they were everywhere. There were vast imperial gardens, large private gardens belonging to wealthy families, temple and shrine gardens, small middle class gardens, and tiny gardens belonging to the poor. New western-style office buildings and hotels had interesting contemporary gardens and if space was unavailable on the ground they grew on roof tops. Department stores, shops of all kinds, restaurants and public buildings all had gardens. Huge public parks had been made from old imperial gardens, and the gardens of former noble families, as well as newly designed parks that incorporated recreational areas with gardens.

It was reassuring to find Tokyo truly a city of landscaped gardens. The most charming gardens we saw in the city were two lovely private ones and the abstract garden areas which were important design elements of the new hotels, office buildings and apartment houses. The types we saw seemed to be divided into two groups; large complicated gardens found behind walls and small relatively simple gardens found wherever space permitted.

When we went to the garden of the exclusive Mitsui Club, we were accompanied by Mr. Shigemaru Shimoyama, a Master of Landscape Architecture (Harvard U. 1922). He explained that there are two basic forms of Japanese landscape gardens: hill gardens, the large gardens I had seen behind walls, and the small flat gardens which were everywhere. He gave us a good but very brief lecture on hill gardens of which the Mitsui Club garden was a particularly good example. Since Mr. Shimoyama had been responsible for its maintenance for many years he was able to point out its basic structure and its many interesting details. This established some criteria by which to judge the gardens we saw later.

Basically a hill garden contains water and has for its central theme a rock bordered, free-form lake or pond surrounded by hills. Islands which may or may not be connected to the land by bridges are an integral part of the design as are winding paths which more or less follow the contour of the lake or pond. Intimate, hidden areas of visual interest are created by careful planting and can only be discovered by following the paths through the garden. Trees of the right size and shape are selected to create a *trompe l'oeil* illusion of forest hills and the garden appears to be larger and more remote than it actually is. The real or imaginary source of water for the lake, usually in the form of a cascade or waterfall, must be hidden from the original view of the garden and is only found later on the tour around the lake. Many small wet or dry streams lead into or out of the lake and are crossed by stepping stones or bridges. Some of the other garden design elements are well designed bridges, stone lanterns, trellises and boat landings.

Many different materials are used in a hill garden. Earth excavated to form the lake is used to make the hills and islands; rocks border the lake and form small islands, cascades, streams, waterways, miniature mountains, paths and stepping stones; flat stones make bridges and boat-landings; bamboo and other woods are used for trellises, bridges, fences, borders for paths and supports for tree limbs; stone is carved into decorative lanterns. There is a great variety of trees and shrubs in a hill garden selected for their size and shape, spring blossoms, or fall colors. Evergreen trees and bushes usually represent about 70 percent of the planting; they keep the garden green year-round. The deciduous plants are chosen to add seasonal interest to the garden. The lake borders are planted with low bushes, interestingly shaped pines and small weeping fruit trees reflected in the water. Taller bushes and trees are planted along the path in interesting clumps and groves to create pleasant views and intimate areas for special planting effects.

Hills are planted in a random fashion with different kinds and colors of trees to give the feeling of a forest. Lawns, since they are not normally found in nature, are not often seen in traditional gardens. There is, however, a wide range of many different ground covers and mosses which are used between shrubs, around rocks and under trees. Frequently flat areas of gravel or small stones, often representing water, are part of a garden design. Japanese use hemp ropes and straw mats to shore up or protect trees and great care is taken to see that these are decorative as well as useful. Annual or perennial flowers are never used in a Japanese garden because their short life span is too reminiscent of the transience of life. The purpose of a garden is to express the basic laws of the universe by showing the permanent laws of nature. Irises, the only exception to this, are planted along lake borders and stream beds in modern hill gardens. Although spectacular in early summer they are not really an exception because their roots remain in the garden and their leaves are part of the year-round garden design.

There is a great deal of seasonal change in a Japanese garden; spring blossoms are followed by summer leaves and autumn color is followed

by winter snow. Once a garden has been created, however, the original composition is maintained. Azaleas and other bushes are clipped in the same shapes as when they were first planted, pine trees carefully trimmed and their needles plucked to keep them from growing, and all other trees pruned to keep their original size and shape. The Japanese are excellent gardeners and have developed marvelous techniques to care for their gardens. Their meticulous methods and wonderful tools are almost as decorative as the gardens themselves.

It is important to remember that a Japanese hill garden is a work of art and while there are many traditional elements in its design, merely being sure that they are all included in a garden does not make it a work of art. A hill garden represents an idealization of nature and so is never composed symmetrically on a central axis. Great attention is paid to the harmonious balance of sizes, shapes, and forms to create a three dimensional design which surrounds the viewer and is artistically valid in any direction from any spot in the garden. A hill garden is a self-contained landscape with no views outside its border included in its design. Spatial relationships are so carefully maintained that even though an incredible number of plants, trees, rocks, and decorative touches are used there is a sense of simplicity and tranquility in a well designed garden.

Behind the Mitsui Club House, a neo-classic grey stone building that would have been at home on Chicago's Michigan Boulevard in the 1890's, is its new seventy-year-old garden. Land in Tokyo is at a premium and a garden of this size, roughly one quarter block square, represents an enormous amount of money. As in all hill gardens the central theme of the Mitsui garden is a rock bordered, gourd-shaped lake containing several small decorative islands. Its paths are made of many different materials, some in interesting mosaic designs. Wet and dry streams are crossed by stepping stones and bridges. Interesting flowering vines grow on trellises over the pathways. Rocks are arranged to create an imaginary waterfall



and interesting outcroppings. Stone lanterns which form intimate compositions with flowering shrubs are placed to light the path or reflect in the lake. Intricately shaped evergreens and weeping fruit trees bend over the water, mirrored in it. Large trees on the hills block out any outside view and give a sense of remoteness and privacy to the garden. Spring blossoms were long gone but the fall colors of the small leaved Japanese maple trees made lovely patterns in the green landscape. The Mitsui garden is a splendid introduction to Japanese hill gardens since it is beautifully designed, marvelously cared for and the architect's attention to the smallest details make it a most interesting example of traditional garden.

The second garden we visited was a much smaller private garden owned by the Doai family. It is also a hill garden and follows the traditional format although it differs from the Mitsui garden in that it contains a tea house and a place for guests to wait until they are called to the tea ceremony. The waiting area is a stone slab boat landing from which guests feed the huge goldfish in the lake. This garden is lovely but it does not have the elegance of detail of the Mitsui garden; it lacks the rich variety of trees and shrubs, and is not as beautifully cared for. The tea house, however, is a gem and the secluded area which surrounds it is reminiscent of a forest glade. It is a lovely tranquil spot with a tiny stream running through it. The garden is cleverly hidden behind walls and the surrounding houses so that from the street there is no hint that a beautiful tranquil garden exists. The Doai garden is a good example of the interest, work, and money Japanese people are willing to spend on their gardens.

We visited the Hana Detached Palace garden which is typical of the imperial gardens and former gardens of noble families that have been made into public parks. It is quite flat but it is basically a hill garden, and although it has the usual lake its most interesting feature is a man-made tidal lagoon, formed by letting the sea flow in and out of a hole in the sea wall.

The Hana Detached Palace garden tragically shows the effects of the smog which hangs over Tokyo and which may ultimately destroy all its gardens, because many of the decorative shrubs and trees found in them are unable to live in a polluted atmosphere. The Japanese are wonderful gardeners and can transplant successfully huge trees to replace dead ones in important gardens such as those around the Imperial Palace, but everywhere in Tokyo trees and shrubs are dying, foliage looks sickly and has a bad color. Experiments similar to those in Mexico City are being made with ginkgo trees to see if they can withstand the pollution but Japanese gardens which depend on variety of trees, shrubs and plants will be lost to Tokyo if only one species can be found to live in its atmosphere.

Tokyo is lucky to have so many examples of hill gardens, especially those which have been made into public parks, but flat gardens which are everywhere are the ones which give the city its character. A flat garden is one which does not contain water. As in hill gardens its design is based on nature and since water is one of the most important elements in nature it must be represented or suggested in the design. Areas of sand or gravel

raked in lines reminiscent of water are frequently used, as are areas of moss or ground cover which also can suggest water. Rocks are used to create shore lines, dry streams, islands, or miniature mountains. Small bridges and stone lanterns are often used as decorative elements. The design of most flat gardens is based on nature but many are abstract compositions using natural materials. The gardens can be very small, only a few rocks carefully placed on a bed of sand, so there is room to put a well designed one anywhere. They fit beside shop doors, in the bottoms of stairwells, on roof tops, between buildings, and in any spot that can be improved with decorative planting. Two very good examples of flat gardens were among those in the Imperial Hotel. One, a roof garden, over the dining room, contained interesting areas of ground cover and well designed groups of dwarf trees and shrubs. The other by the front entrance was a marvelous composition of gravel ground cover, a few shrubs, and a stone lantern. Flat gardens are particularly successful with contemporary buildings because the abstract designs and the visual interest created by them can be a major part of their decoration. As in any other art form there are examples which are imaginative compositions and others which are contrived arrangements. Particular attention must be paid to the care of these gardens. Nothing can be out of place or the design will be destroyed. In these small garden areas Japanese gardening techniques are particularly important.

Tokyo was a very good introduction to Japan but we were happy to board our bus for Nara and Kyoto to see the great classic gardens. The tour guide's lecture on the bus and a few chapters from our books gave some clues why gardens mean so much to Japanese of all classes. To begin with, all Japanese are ethnically very similar and therefore tend to have similar likes and dislikes. Their common ancestors are thought to be south sea islanders, Korean mainlanders and a few visitors from Mongolia. For two thousand years Japan was a rigidly controlled feudal island closed to all outside influences except for two periods, one in the fifth century and one in the fourteenth when Chinese culture and religion were imported wholesale; there was also a limited trade with Korea which did not greatly influence the Japanese. During this long feudal era those in power were able to set the style of life for all Japanese. They saw that class distinctions and privileges were carefully maintained. Japanese people have always been basically agricultural, and close to nature. They were influenced by the great natural beauty of their islands. Shintoism, the early Japanese religion which worshipped nature gods, has always had its shrines and holy places in the most beautiful places in Japan. Buddhism, imported from China, helped solidify the Japanese interest in nature, because it taught that meditation on natural laws in places of tranquil beauty could help one understand the universe. The building of temple gardens and private gardens developed into an ecclesiastic art when it became necessary to provide the proper atmosphere for the contemplation of Buddha.

We found that the first Japanese landscape gardens were built in Nara which was also the first permanent capital of Japan. Before the seventh century the seat of government had moved to wherever the reigning emperor lived. Emperors for the last eighteen hundred years have all belonged to the same family but in the very early days sons did not often live to succeed fathers and when rule passed to the next in line he just moved the capital to his feudal village. With the advent of Chinese culture and Buddhism in the fifth century, however, the necessity for a permanent capital became apparent. Large monasteries and temples were needed for worship and large Chinese style palaces could not be built in a different village for each new reign. The first gardens in Nara were built for an early empress and were patterned after the vast imperial gardens seen by the early envoys sent to China.

The Chinese gardens were an idealization of the world. They had huge man-made lakes which represented oceans and their landscaping recreated the scenic beauties of northern China. Rivers were dug to connect the lakes and provide waterways for noblemen and musicians to float on barges to different parts of the garden. Islands symbolic of the misty-isles, where the immortals lived, were found in the large lakes and pavilions were built there for the emperor and his ladies. A few Japanese garden lakes have been large enough for barges but gardens in Japan have always covered acres instead of miles. The format of a lake containing islands surrounded by landscaped hills, however, was followed from the first and became the prototype of all Japanese hill gardens.

Early Japanese gardens were designed by monks who were the religious leaders of the time and by noblemen who had been sent to China. These were the men of culture and education and the artists of the day. This practice continued and when contact with China was cut off in the seventh century it was the religious leaders and the intellectuals who continued to design the gardens and who developed the Japanese style of landscape gardening.

The Japanese styles of landscape gardening evolved from the ninth through the fifteenth century. While Chinese gardens, especially those in the south, tried to recreate the mountain landscape of the north, the Japanese who did not know this area were not interested in copying it but became fascinated with the sea coast landscapes of their own islands and modeled the banks of their lakes after these. They planted the hills in their gardens to look like the forested areas of Japan. Islands in the lakes took the shape of tortoises that were supposed to anchor the islands of the immortals to one spot.

Many examples of gardens of this period, which is the classic period of Japanese landscape architecture, have been preserved. One of the most controversial and best known gardens of Japan, the Ryoanji, dates from this period. It is the famous flat garden composed of fifteen rocks placed in five groups on carefully raked sand. Many different interpretations, such as a tiger and its cubs fleeing over water, have been given to the design but they seem to be too limiting and unnecessary. It is enough that this

is a marvelously designed and constructed abstraction. This garden is the best example of those created as places of meditation by the Zen Buddhists.

Along with the arrival of Zen Buddhism which took place roughly in the thirteenth century, other major changes took place which affected the development of landscape gardening. The first major change was in the government. The emperor was still the titular head of the country but his role had become ceremonial and the actual rule was carried on by a Shogun. The Shogun was the head of a feudal family who had earned the hereditary right to defend the emperor and govern for him by defeating the other powerful feudal families. Dynastic battles for control were confined to the shogunate and the succession of the imperial family was never challenged. The emperors carried out their ceremonial duties and became the center of the cultural, religious and artistic life of Japan. It was not unusual for an emperor, when his ceremonial duties were over, to abdicate, become a monk, and build a retreat for himself. The emperors usually designed and supervised the maintenance of their gardens; when members of the nobility followed their lead, landscape gardening became one of the most important cultural activities in Japan.

The second period of Chinese influence was another change which affected Japanese culture, religion and art. The principal influence on gardens was the beautiful Sung dynasty scroll paintings of idealized landscapes. Typically these showed a lake or river, decorative trees, and craggy mountains in the background. The Japanese became fascinated with the mountains, and the rock work in their gardens became miniature Chinese mountains and cascades.

The tea ceremony introduced into Japan in the fourteenth century in order to promote tranquility and to help find the path to Buddha, affected the development of Japanese landscape gardens. The ceremony has very rigid rules which must be followed. It can only take place in a tea house, or simple rustic hut built to strict specifications and the house must be situated in a tranquil spot. A small trickle of water or stone water basin has to be provided at the door for the guests to purify themselves. The entrance to the tea house must be screened from the path and the view from the front of it should encourage meditation. These requirements became an integral part of garden design and the correct placing of the tea house or tea houses became the most important consideration in the design of many gardens.

One of the loveliest gardens in Kyoto which belongs to the Katsura Villa has four tea houses. These are carefully placed around an imaginative lake. A charming path leads from one tea house to another and because great attention has been given to the placement of the tea houses they all have lovely views of the lake and surrounding garden. One, the moon-viewing tea house, is placed so that the full autumn moon can be seen from its porch as it rises over the miniature mountain on the other side of the lake. One of the tea houses is a very informal affair meant for drinking sake on a warm summer afternoon. This garden shows the influence of Chinese scroll paintings in the positioning of large rocks which



resemble miniature Chinese mountains. The lovely hill or small mountain across the lake from the villa is beautifully planted and the path which winds up to the top of it gives a very successful impression of a small mountain pass. This garden is particularly important because it belongs to the imperial family and has been maintained in its original form. The garden is part of the estate Prince Toshihito built for himself on the outskirts of Kyoto. He was the favorite nephew of one of the emperors and a man of great culture and talent. His estate is simple but highly sophisticated and great care went into every detail. It is thought that the prince may have been helped with the garden by Kobori Enshu, a famous tea master and garden designer, but the prince was undoubtedly its main designer.

Shugaju-in, another remarkable imperial villa, was built by the Emperor Gomizuno-o, Prince Toshihito's uncle, on the hills above Kyoto. It is also beautifully preserved and has two very well designed but quite usual gardens and one unusual garden high on the hill which incorporates in its design a beautiful view of the surrounding country. The view from the tea house at the top of the garden is down an azalea planted hill, across a lovely tree rimmed lake and on to the distant hills. The garden design is one of the few in Japan that uses "borrowed scenery," or a view outside of the garden itself. A path winds down the hill and joins a typical path that follows the contour of the lake. There are the usual details found in most Japanese gardens plus a wonderful Chinese style red vermilion bridge that adds a lovely bit of color. Shugaju-in is an interesting estate to visit because its orchards and field are still being worked and there are some very good specimen trees in the lower gardens. Apparently this estate was not meant to be used as a permanent residence but only as a retreat for a few days. The buildings in the ladies' and gentlemen's compounds are simple but excellent examples of traditional architecture.

In Kyoto the art of landscape gardening grew to its fullest and developed here its Japanese character. It was here that rules were established as guidelines for future gardens. When the capital was moved to Tokyo

in the eighteenth century these rules were followed in designing the gardens for the new palaces and sumptuous homes of the nobles. By this time gardens were no longer designed by monks, or their illustrious owners, but by highly skilled gardeners who had gradually taken over the design chores. Some of these men were well trained but they lacked the artist's creative talent and imagination.

When the Japanese feudal system finally came to an end in 1868 the emperor regained complete control of the government and the huge holdings of the Shoguns, including their vast gardens, became imperial property. Many of the estates and gardens of the nobility found their way into the hands of the wealthy financiers and merchants who previously had not been allowed to own large gardens by the strict laws which had governed class privileges. As it became possible for anyone with the money or interest to own a garden many took advantage of the change and gardens sprang up all over Tokyo. It is the gardens from this period, like the one we saw at the Mitsui Club and the ones which have been made into public gardens, that add so much to Tokyo today.

Since the occupation following the Japanese-American conflict, landscape gardening has continued to be an important part of Japanese life. Many new gardens have been built and many ancient ones which had been forgotten have been found and restored. Japan is going through a period of great activity and creativity and Japanese scholars are studying the past to get a true picture of Japan's artistic development. Much time and effort and modern methods have gone into researching ancient gardens to discover their design principles and construction methods. This has been a great help to modern landscape designers. They are learning through comparing the measurements and proportions of many gardens that there is no rule of thumb which can guarantee a perfectly designed garden.

Landscape gardening is so successful in Japan that it is unusual to see anything that is really bad, but incredibly bad examples can be found in the huge tennis-court-sized glass houses which cover the thermal pools at the hot springs resort hotels. Hollywood could not do a worse job of putting together orchids, palms, fake flowers, little blue grottos, and thermal pools; Tondelayo would be right at home.

It is easy to see why traditional Japanese gardens still please Japanese people. The peace and tranquility of a stylized garden is a pleasant change from the noisy crowded conditions of their cities. Japanese people have always been lovers of nature. They still enjoy looking at beautiful scenery and taking care of their plants and gardens. Many who have just recently moved to the cities from the country are still farmers at heart. Japanese interest in their cultural traditions and art forms is particularly keen at the present time. They hope by keeping these alive to reestablish their personal identity and maintain as many of their national characteristics as possible in the midst of vast social, economic and political changes.

To a westerner Japanese gardens are very interesting but tend to seem sterile. It is marvelous to see a very old garden in its original form with its interesting design and planting, but it is disturbing that growing things are forced to keep the same size and shape. Most of us are more used to

meditating on the wonders of the universe by looking at an actual landscape rather than at an idealized version of what nature ought to be. It is interesting that, while the Japanese travel great distances to see their lovely natural scenery, their important hill gardens create a distinct and rather uncomfortable hemmed-in feeling. This is particularly noticeable since all but one or two of their gardens have the same enclosed designs. Nevertheless it is impossible not to be impressed with the beauty and tranquility of a lovely Japanese garden.

THALASSA CRUSO COMING TO DENVER

Barbara Benton

Since its inception in 1960, Denver Botanic Gardens Guild has been one of the volunteer groups dedicated to enhancing the beauty of the Gardens. Totally responsible for the maintenance of the existing formal herb garden, dedicated in 1965, and underwriting and supervising its extension now in progress, the Guild also presents the annual Garden Tours and makes and bottles the herb vinegar available in the Gift Shop.

Now, with pleasure and excitement, the fifty-member Guild brings the entertaining, witty and knowledgeable Thalassa Cruso to Denver's Horticulture Hall for two appearances in October — a lecture at 8:00 p.m. on Wednesday, October 16, and a plant clinic (where Ms. Cruso urges bringing problem plants and/or *specific* questions) at 10:00 a.m. on Thursday, October 17. All proceeds will go to Denver Botanic Gardens for the herb garden extension.

Thalassa Cruso has lived and gardened in Boston since 1935. She was born and raised in England, where she had a thorough apprenticeship in horticulture taught by innumerable gardening relatives. Throughout her career as an archaeologist, curator, writer, wife, mother, and grandmother, she has gardened outdoors and

indoors, here and abroad. Since 1967, when her television program *Making Things Grow* began, she has been a guide and mentor to America's indoor gardeners. She is a Fellow of the Society of Antiquaries of London, a member of the Royal Archaeological Institute, the Royal Horticultural Society, the Garden Club of America, the Garden Club Federation of Massachusetts, and the Massachusetts Horticultural Society, and is an accredited horticultural judge and the winner of many gardening and greenhouse awards. In 1969 she was awarded the Garden Club of America's Medal of Merit by the Chestnut Hill Garden Club. In 1970 she was the recipient of the Horticultural Society of New York's citation for distinguished horticultural service and the Garden Club of America's Distinguished Service medal.

Ms. Cruso's three books on gardening can be purchased now at the Gift Shop or borrowed from the Denver Botanic Gardens library. Copies of her books and herb vinegar from the herb garden will be on sale at both events in October.

Tickets are available at Denver Botanic Gardens, from Guild members, and at several other central locations for a \$4.00 Donation (tax deductible) for *each* event.

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The Green Thumb

VOL. THIRTY-ONE, NUMBER FOUR

WINTER 1974



THE COVER

Main Staircase,
Denver Botanic Gardens
House.
Drawing by Ann Papageorge

THE GREEN THUMB

WINTER 1974

VOL. THIRTY-ONE, NUMBER FOUR

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DR. C. EUGENE OSBORNE – EDITOR

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The House at 909 York

Virginia McConnell Simmons

In a residential section of Denver graced by many handsome homes, the charming house on the northwest corner of York Street and Ninth Avenue is one of the most appealing. Traffic on the streets around it does not seem to intrude upon the quiet dignity of the house and its shaded lawn, but the view across the colorful acres of the Denver Botanic Gardens to the rear of the house reveals another aspect. Though attractive and inviting, there is something businesslike about this face. Usually several automobiles are parked in the sunny courtyard, and people come and go, for this is the headquarters building of the Denver Botanic Gardens.

In learning how this residence became an office and meeting place, one also learns several interesting chapters of the history of Denver as well as the Botanic Gardens. This story involves the city's cemeteries, parks, leading families, architecture and art, and how the Denver Botanic Gardens came into being.

When Denver's founding fathers organized their new community on Cherry Creek, they also were forced quickly to choose a site for a cemetery. They put it far from the center of town — then on Larimer Street — and buried their first deceased citizens out among the cacti on or near the present location of the Botanic Gardens. According to Denver's early historian, Jerome C. Smiley, the first grave there was that of Jack O'Neill, murdered in 1858. For several years this forlorn place was referred to as "Jack O'Neill's Rancho", even after other burials had joined his. Uncared for, the grounds were trampled and headboards were knocked down by livestock grazing on the prairie.

Before many years sections of the cemetery were set aside for members of

different churches, lodges, and other groups. About 1870 when the city requested title from Congress for the cemetery and adjoining lands totaling 160 acres, the Catholic Church sought title for its forty-acre portion. Unfortunately, Congress granted both titles through some oversight. Both titles ran north from Eighth Avenue, but the 40 acres in dispute occupied a leg along the Eighth Avenue base extending eastward of the rest of the 160 acres. When the city began to plan a park, which eventually became Cheesman Park, all except the Roman Catholic graves were removed from the cemetery. The Catholic area, by then called Mt. Calvary, continued to contain an unknown number of burials, although some bodies were moved to the Catholic Mt. Olivet Cemetery. The remaining uncared-for graves were not moved until after 1950, when Denver bought the Mt. Calvary Cemetery, or the still-existing 18 acres of it, to be precise.

As Denver had grown, subdivisions were developed away from the city's downtown area. The owner of one of these, called "Morgan's Subdivision of Capitol Hill," purchased the southern part of Mt. Calvary Cemetery from the church about 1900. One of the families attracted to the area was that of Richard Crawford Campbell. Mrs. Campbell was the former Margaret Patterson, whose father, Thomas M. Patterson, had owned the *Rocky Mountain News* and had been a United States Senator. Mr. Campbell was business manager of the *News* for many years and afterward headed the Campbell Investment Company. He also was a well-known yachtsman.

The Campbells chose architect Jules Jacques Benois Benedict to design their home in Morgan's Subdivision at 909



Ceiling Detail

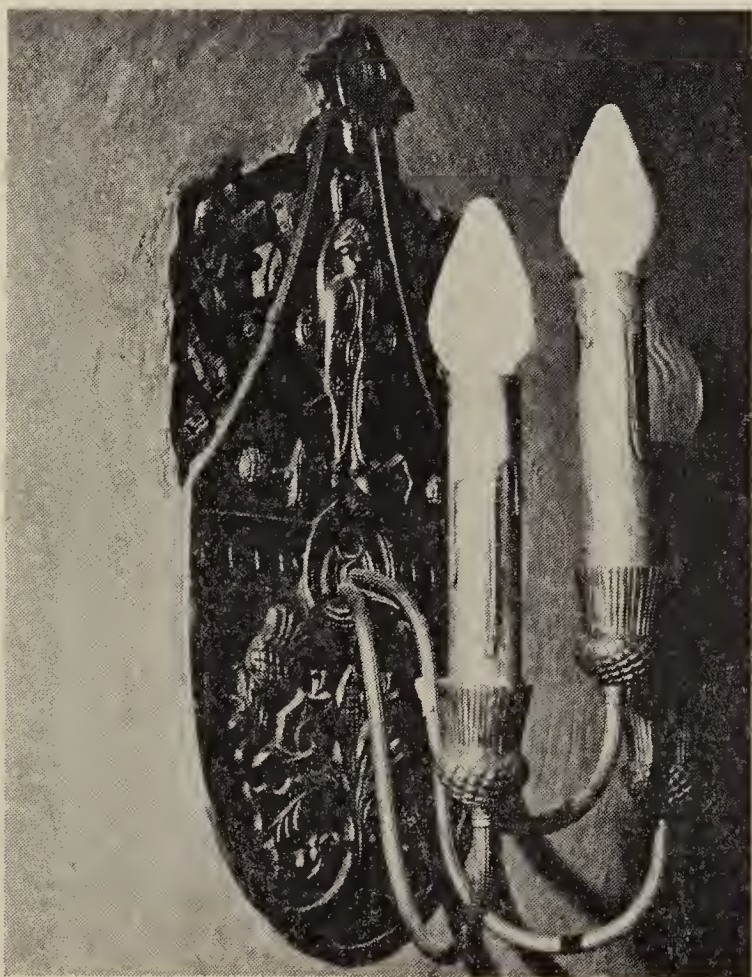
York. A native of Chicago, Benedict was educated at the Boston School of Technology, the Chicago Art Institute, and the Ecole de Beaux Arts in Paris. He began his career in architecture and design at New York before coming to Denver, where he designed both public and domestic buildings. Among the many homes which he did for Denver's social leaders were the Weckbaugh mansion on East Cedar Avenue and the John Kerr residence on East Seventh Avenue.

Benedict conceived a home of unusual artistry and comfort for the Campbells. Although its size is impressive — with 4,000 square feet on the first floor and nearly as many on the second — it contrasted with the imposing dimensions and style of the Patterson mansion, where Margaret had grown up and spent most of her married life. Even fine homes in the early 1900's were more compact than were the "great houses" of the nineteenth century, as a rule. They were arranged to utilize the new developments in central heating, plumbing and lighting. The style, too, was fairly typical of the trend then current in America to borrow characteristics from other periods and

places. They might be Georgian, Italian, French, or a combination of these or others. Benedict called his own eclectic style "*Beaux Art.*"

Constructed of brick and stucco with a green tile roof, the personality of the Campbell house was one of warmth and grace. Arched windows, flagstone porches and walkways, a balcony over a large bay window, a sweeping curved staircase, a sloping ceiling over the second-floor stairway contributed then, and still, to its charm. Four fireplaces shed an air of hospitableness.

The most distinctive feature of the house is the infinite care with which the details of finish were carried out. Ceilings and other trim were painted by John Thompson, a prominent Denver artist who also headed Denver University's art department. Bronze lighting fixtures on the walls and switchplates were cast in harmonizing motif. Carpets were woven in Europe to fit the shape and blend with the decoration of the rooms. Dominating the living room's north wall, the fireplace was ornamented with carved stone. Just as paneling lent charm to the library, leaded windows in the dining room's bay window made that room inviting. An intriguing feature was



Lighting Fixture

a stairway built to connect the library and the sitting room of the master suite on the upper floor. To reach the "secret staircase" and a wine cellar beneath it, one swung aside a bookcase on the north wall of the library. After the Campbells moved into the home, the tapestries still seen on the first floor were added.

Rooms were efficiently laid out to provide for entertaining, family living and quarters for a small staff. Servants lived in the garage and in the northwest section of the second floor. Sleeping and sitting rooms in the main part of the upper floor now are executive offices. In the basement there is a workroom, reached by a stairway from the back entrance. The large furnace room in the basement was walled with brick and closed behind an immense steel fire door.

Moving day was a happy one when the house at last was ready for occupancy in 1927. The neighbors, some of whom had been lifelong friends of Mrs. Campbell, turned out to welcome the new arrivals with a parade led by a bagpiper playing "The Campbells are Coming."



Fireplace



Main Staircase

Only two years later, both Mr. and Mrs. Campbell had died and the house was purchased by Elmer Hartner, who owned the Western Seed Company. It is not surprising that the Hartners had a gardener and maintained a small greenhouse on the property. In addition to a lily pond which they built in the southwest lawn, they also had a large garden in part of the abandoned cemetery. The Hartner family added their own furnishings, including the draperies which are found today in the livingroom. A teetotaler, Mr. Hartner used the wine-cellar to store his photographic equipment.

On September 21, 1958, the *Denver Post* reported that the "Normandy residence" of the Elmer Hartner family would become the headquarters of the Denver Botanic Gardens Foundation and that the adjoining eighteen-acre tract, formerly Mt. Calvary Cemetery, would be developed as a botanic garden. Mrs. James J. Waring purchased the house from the Hartners and gave it to the Denver Botanic Gardens as a memorial to her father, pioneer businessman and philanthropist, Henry M. Porter. For many years Mrs. Waring lived in the

home adjacent to 909 York on Ninth Avenue, also designed by Benedict.

The transfer of ownership was consummated early in 1959, and on April 1 the official opening of the Botanic Gardens House was observed. The building served briefly as office also for the Colorado Forestry and Horticultural Association, until both organizations merged in 1960. The Colorado Forestry and Horticultural Association, organized in 1944, had carried out a number of projects throughout the state, including the development and planting of some of the gardens in City Park. Efforts to create an herbaceous unit there were thwarted by vandalism and other problems. Mrs. Waring's gift of the house and the designation by the city of the Mt. Calvary Cemetery site for use as a garden fulfilled the dreams of the members of the older organization as well as of the newer one.

For several years the Botanic Gardens House served all of the functions now provided for by both the House and Horticulture Hall. Besides the administrative office, the House was used for meetings, teas, and conferences. Research and educational activities also were carried on in the House. The Helen Fowler Library of horticultural and botanical material was located in the library, while the Kathryn Kalmbach Herbarium of dried plant specimens was stored in linen closets on the second

floor. Both of these resources moved into Horticulture Hall in 1971, as did meetings too large for the House. Although the public most often knows the Botanic Gardens as that fascinating place called the Boettcher Memorial Conservatory, opened in 1966, or as the gardens lying between York Street and Cheesman Park, the House has remained the behind-the-scenes nerve center of the entire program.

In 1973 the structure was designated a Denver landmark by the Denver Landmark Preservation Commission in recognition of the building's outstanding architecture and value. Rarely have beauty and utility been so happily joined as in the Denver Botanic Gardens House.

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*Detail
of
Switch
Plate*

IS OIL SHALE REHABILITATION POSSIBLE?

E. F. Sedgley

State Resource Conservationist, SCS

Mr. Sedgley, a native of Philadelphia, Pennsylvania, served in the U.S. Army Air Force during World War II. He earned a B.S. degree in range management from Colorado State University and served in the Soil Conservation Service at Meeker, Colorado from 1953 to 1960, and at Worland, Wyoming, until 1970, when he became State Resource Conservationist.

The 25,000 square miles of commercial oil shale lands in Colorado, Utah, and Wyoming comprise a complex pattern of soils and plant communities. Elevations range from less than 5,000 feet in the semiarid Uintah Basin to above 8,500 feet along the southern edge of the Piceance Creek Watershed. Precipitation zones follow the elevations and range from 7 inches to 24 inches. The harsh topography provides a variety of slopes, aspects, and geologic parent materials upon which the plant communities and soils have evolved. To further complicate the situation, an irregular pattern of abnormal biotic influences has been imposed upon the land by man's activities, principally livestock grazing and the manipulation of big game populations.

In order to understand revegetation potentials, a basic knowledge of ecological processes influencing plant communities is essential. It is important to evaluate plant communities not only on the basis of what is growing there now, but also from the standpoint of what might grow there if abnormal disturbance factors were removed. "As vegetation develops, the same area becomes successively occupied by different plant communities. This process is termed 'plant succession' . . . The climax formation represents the highest type of vegetation possible under its particular climate . . . Every complete sere ends in a climax when a point is reached where the occupation and reaction of the dominants or dominant are such as to exclude the invasion of other dominants."¹ If we accept this principle and the fact that soil evolves simultaneously with plant communities, it is apparent that soils and climax plant communities can be identified and described through the study of sites where abnormal disturbance has not occurred. By comparing plant communities at or near climax condition to those existing on the same soils but subjected to varying degrees of disturbance, deviations from climax or successional stages may be reasonably identified. Even climax plant communities are dynamic and tend to fluctuate with normal climatic cycles, but these changes are minor compared to those that occur as a result of drastic disturbances. When large numbers of grazing animals are introduced into the natural ecosystem, selective grazing soon causes a downward trend in the successional process. Palatable plants are replaced by less palatable ones and a disclimax plant community results.

Keeping these facts in mind, let's take a look at the oil shale country as it exists today. It is a mistake to assume that the vegetation of the oil shale area is pristine. During my tenure as District Conservationist in the oil shale area of Colorado, I was privileged to associate with pioneer ranchers with first-hand experience of the "open range" period. They tell of vast herds of cattle grazing the free public lands. When the ranges had deteriorated to a point where cattle grazing was marginal, the sheepmen moved in to get what was left. It was only after fifty years of range misuse that any



Typical landscape in Piceance Creek Basin showing piñon-juniper and sagebrush-grass plant communities.

semblance of management was initiated. This situation is documented in a report from the Secretary of Agriculture to the United States Senate, prepared in 1936, entitled *The Western Range*. At this time, it was estimated that federal public domain ranges had lost 67 percent of their potential to produce. The disclimaxes developed during the open range period are still evident in the oil shale country. Recovery through natural succession is slow even under good management.

During the 1940's and 50's a large buildup of mule deer offset to some extent the decreased number of livestock grazing under BLM management. I have personally counted over one thousand deer, in less than an hour, grazing the Piceance Creek Valley in April. In the Piceance Creek Basin of Colorado, which contains 80 percent of the commercial oil shale, pinyon-juniper, sagebrush-grass, and mountain shrub associations cover 90 percent of the total area. The deep-soiled valleys now covered by coarse sagebrush, greasewood, and rabbitbrush, were once dominated by perennial grasses. The upland slopes and benches now dominated by big sagebrush and invaded by pinyon-juniper were also once productive grasslands intermingled with a variety of shrubs and forbs.

In Utah, 75 percent of the oil shale area is covered by the salt-desert shrub association. Large areas are in the lowest stages of plant succession containing only annual mustards, halogeton, cheatgrass, and remnants of the once dominant desert shrubs and perennial grasses. Mary Louise Giblin, of *The Grand Junction Sentinel*, had this to say after her first trip to the oil shale country, "My suspicion is that too many people in far-away places see Colorful Colorado's much-publicized oil shale lands as looking like the White House lawn after the gardener has been there . . . They should have been in tract C-b, southeast of Rangely, when the bus wouldn't go any farther because the dust seeped into the motor inner-workings, and the touring group got to fight gnats, heat, and dust while waiting to be picked up. They probably wouldn't have enjoyed the heat and dirt any more than those on the trip did. But, at least, they might be more realistic about their frantic fears that mining in the shale country is going to ruin forever some lands that really are not all that lush to start with."²

At the present time, commercial development of oil shale appears inevitable. The 600-billion barrels of recoverable oil locked in the Green River formation is a vast resource and the energy crisis is real. The commercial development of oil shale will undoubtedly create severe environmental disturbances, but I am optimistic that the land itself can be rehabilitated, in many cases to plant communities superior to those now existing. Each commercial operation will present a unique challenge to the reclamation planner. A planned open-pit operation may create a cavity one thousand feet deep and covering 2,500 acres. Room and pillar mining will produce over 100,000 tons of waste material from processed shale each day. Underground *in situ* mining will

require the disposal of large quantities of raw shale excavated from tunnels, shafts, and retort rooms. Supporting facilities will probably require the largest area of environmental disturbance. These include roads, railroads, utility corridors, plant sites, and new communities to accommodate the influx of people. The planner must be able to identify the desired future use of mining sites; evaluate the site according to its capability for that use; and identify the alternatives and potential for acceptable rehabilitation. He must be fully aware of the present technology available and the status of on-going research. Through careful planning, he must see that site factors are manipulated to produce, within reason, the most favorable circumstances for successful revegetation and rehabilitation of the land.

While research needs are apparent, it must be recognized that time frames are critical. Most vegetation research requires many years to acquire useful information. Oil shale developers are predicting commercial development in 5 years. Site facilities are already under construction on several private oil shale tracts. Obviously, those charged with land rehabilitation will need to rely heavily on present technology and utilize fully the research findings as they occur. Another problem the planner may face is the unavailability of desired plant materials. Many of the native species are not available in quantity. It takes 4 to 5 years of lead time to produce an adequate supply of presently unavailable species.

The rehabilitation of western rangelands is not a new science. The Soil Conservation Service has assisted landowners in the successful revegetation of over 16 million acres. Through its plant materials program, the Soil Conservation Service has tested over 400 species and 6,000 accessions of native and introduced plants adapted to the oil shale region. Natural plant communities have been described in range site descriptions and are supplemented in many areas by taxonomic soil surveys. A great deal of expertise and experience in revegetation is also available from other agencies including the U.S. Forest Service, the Bureau of Land Management, and the Agricultural Research Service at the federal level and state universities and highway departments at the state level. The Colony Development Operation has been carrying out extensive research since 1967 to determine the feasibility of revegetating spent shale materials. This research is being expanded by other companies and through cooperative efforts by government and industry. Results from this research are promising.



CSU plots on spent shale material at Anvil Points – a research project financed by federal and state government and industry.

SCS photo



A typical valley bottom in the Piceance Creek Basin with good alluvial soils and high potential for a perennial grass-dominated plant community, presently in a low successional stage of big sagebrush and cheatgrass.

The success or failure of the reclamation effort will depend upon the quality of information used to develop the mining plan and the willingness of the operator to absorb the cost of manipulating site factors to insure success. The successful revegetation of oil shale sites will not be easy, but I believe it can be done if present technology is fully utilized and research is planned to acquire necessary additional knowledge.

It must be recognized that successful revegetation does not mean that change will not occur. The encroachment by man to harvest the oil shale resource will create lasting impacts. A reconstructed environment following the disturbances associated with oil shale development will be different than that now existing. Man's activities will certainly have an impact on wildlife species and the social structure of present human inhabitants. Too often environmental change is interpreted as environmental ruin. The conflicts between those advocating development and those wanting to leave the land as it is will probably never be resolved. At this stage, it appears that the political decision has been made to get on with oil shale development. If this is so, every effort should now be made to minimize the environmental impacts; to restore the land to a condition that assures soil stability, prevents pollution, and is productive and esthetically acceptable.

¹Weaver & Clements. *Plant Ecology*. New York: McGraw Hill, 1935.

²*Grand Junction Daily Sentinel*, July 11, 1974.



REVEGETATION: A TEN YEAR STUDY

W. James Duffield
Colony Development Operation
Atlantic-Richfield Company, Operator
Grand Valley, Colorado

With the development of a commercial oil shale industry to western Colorado, there will be large quantities of spent oil shale in need of disposal. This spent oil shale, termed processed shale in the TOSCO II process, has been the focus of much concern. The planned method of disposal calls for depositing the processed shale in embankments which will fill several small side draws in Davis Gulch on the Roan Plateau. Once the material has been deposited, a program of vegetation establishment of revegetation is planned to stabilize the disposal area and restore the area to a productive condition similar in species composition to the present vegetation.

Based on research done by Colony Development Operation personnel and a number of independent consultants, there is sufficient information available to give reason to expect success in establishing a good plant cover on the processed shale disposal embankment. The revegetation program is being designed with the aid and expertise of personnel from the Departments of Agronomy and Range Science at Colorado State University and Utah State University, the Soil Conservation Service, and Forest Service, as well as the aid of private individuals noted for their knowledge of growing native plants. The vegetation program is just one phase of the total environmental program for which Colony was the recipient of one of the Soil Conservation Service National Merit Awards.

Work has been progressing ever since the first field plots were established to test the growth of grass on processed shale in 1965. Since then, seven field plots and a number of study areas have been established at Parachute Creek to study the performance of sixty-eight species and varieties of plants. In addition, a number of greenhouse studies have been undertaken. The reports of these studies* have been published by Colony as an appendix volume to the multi-volume Environmental Impact Analysis which details the plans for an oil shale plant and the effects of such a development on the environment. A brief description of these past efforts will be presented later.

The processed shale from the TOSCO II process is a fine, silt-loam textured black material which is low in available nitrogen and phosphorus and has a high soluble salt content. Many people only casually acquainted with the Colony research program have concluded that these features will prevent a successful revegetation program. This is not necessarily the case, however. To many people dark color is synonymous with high fertility. Some of the more productive soils of the world are silty or of a silt-loam nature. Nutrients are inexpensive ingredients that are used almost universally in agriculture. And, finally, salinity problems should present no major obstacle as greenhouse and field work have shown.

The low fertility of the processed shale will be initially improved by the addition of fertilizers. As the vegetation becomes established, the decomposition of the newly deposited organic material on the surface of the processed shale will build a nutrient cycle which should be self-sustaining.

Studies have also evaluated the benefits of using sewage sludge, ground garbage, and stockyards wastes to stimulate microbial activity and aid in the establishment of a nutrient cycle. At present, an initial application of phosphorus and nitrogen is planned, with additional applications of nitrogen to be applied as needed. To date, none of the



The experimental plot on processed shale in 1971 just after seed planting and placing of excelsior mulch over most of the plot. Six other mulch treatments appear in the right foreground.



Plant growth in the same plot showing vigorous growths of sweet clover and ten different grass species.

test plots have shown a serious nitrogen deficiency that would indicate that fertilizer application would necessarily continue beyond three to five years after the initial application. Also, the use of legumes in the mixture of species would aid through the fixation of atmospheric nitrogen for use by the growing plants.

The high soluble salt content can easily be lowered to tolerable levels for plants by leaching with water. Since many of the native soils are saline and many species of plants are adapted to grow on them, the salinity should not be a problem to the revegetation process once the salts are leached from the zone of root growth. Due to the fine texture of the material, however, the rate at which water will soak into the processed shale is quite low and requires that irrigation be steady and at low rates. Although plans call for the leaching of the salts from the zone of active root growth, there should be no cause for alarm that these salts will find their way into the Colorado River. Studies indicate that the salts will be forced deeper into the disposal embankment with irrigations and then stabilized within the embankment in a profile similar to the salt concentrations found in native soils. Any surface leachate would be retained by a catchment dam below the embankment, and then reused in the production process.

Additional studies, still in progress, indicate that a six inch soil or talus cover over the frontal slopes of the processed shale embankment will greatly aid in the establishment of a vegetation cover. Such a cover would aid greatly to increasing the infiltration rate of water into the processed shale as well as serving to blend the color of the embankment into the surroundings and inoculating the processed shale with the native soil micro-organisms.

Results of the species evaluation plots have shown that it is possible to establish a plant community on fertilized, irrigated processed shale which is well within the range of productivity of native plant communities. Productivity measurements made within one of the gulches on the plateau in terms of pounds of herbage produced per acre range from 900 to 2100 pounds, while figures from the Colony plots have been 1380 and 1700 pounds. In addition, the species composition of the revegetated areas can be planted so that the species used might be more palatable or desirable for wildlife and livestock than might exist in native communities.

The initial field study, in 1965, took place near Denver and demonstrated the ability of four grass species to grow on irrigated processed shale. Tall wheatgrass showed the best growth in all treatment while intermediate wheatgrass, Russian wildrye, and orchard grass did well but produced less growth.

The next study was a detailed greenhouse effort in 1966 to determine the amount of growth obtained by these same grass species in relation to various amounts of fertilizer and leaching. This study was followed by a series of field and greenhouse experiments to provide more information on species suitability in relation to fertilizer variation and soil amendments. At the same time, the first on-site field plots were established. These plots tested various planting depths, mulch treatments, acid treatment to counter the alkalinity of processed shale, and irrigation. Again, full growth was observed for tall wheatgrass.

These studies were followed by more elaborate experimental studies in 1971 which were established at the actual site of what was then contemplated as the final processed shale embankment in the East Middle Fork Canyon of Parachute Creek. This study compared the growth rates of ten species of grasses and forbs on replicated plots and their growth on unreplicated plots with varied types of mulch and fertilizer rates. The results of these plots are shown in the accompanying photographs.

In 1972, four types of plots were set up to study the growth of many species of shrubs, forbs and grasses on native soil, processed shale, and a mixture of the native soils and processed shale. Additional plots were set up to evaluate the use of a soil cover on the processed shale. The Soil Conservation Service plots were set up to study



*Growth of a transplanted juniper
in a processed shale plot
illustrates woody plants can
do well in this medium.*

the growth of various strains of plant materials from the Las Lunas Plant Materials Center on unleached processed shale, native soil, and a mixture of equal parts of these. As these last plots were to receive no supplementary water, seedling establishment was anticipated to be poor. Although this was the case, the shrub transplants did survive and grow well.

The other three plots put in at this time consisted of two replications of species evaluation plots in which a number of species were seeded to evaluate germination and survival, and a set of plots on the plateau which set up the same treatments to be evaluated at the different altitude. These plots all used leached, fertilized processed shale and have shown good growth and survival as anticipated from the results with the earlier plots.

In summary, it is felt that Colony's revegetation program has taken an in-depth look at the problems posed by a processed shale disposal embankment and has gained enough information to make a valid assessment of the situation. This information, coupled with today's sophisticated agricultural technology, indicates that revegetation of processed oil shale is not only possible but is a viable undertaking.

* Bloch, M.B., and P.D. Kilburn (Eds.), 1973.

Processed Shale Revegetation Studies, 1965-1973, Colony Development Operation, Denver, Colorado, 206 p. (Available from the Colony offices)

Note: *The Green Thumb* magazine invites other viewpoints concerning oil shale development and vegetation. The editor reserves the right to make decisions on publication.

New Greenhouses at The Denver Botanic Gardens

F. H. Wingate

In January, 1966, the Boettcher Memorial Center consisted of the Conservatory and two auxiliary greenhouses, together with a heating plant and shop areas. In a relatively short time the two greenhouses were filled to capacity with tropical plants, leaving little space for propagation of plants for other needs. Denver Botanic Gardens was forced to request the City Park Greenhouses to grow the annual plants for its outdoor areas. The two greenhouses were originally planned for research purposes and for the growing of plants to be placed in the tropical Conservatory. Shortage of growing space eventually brought about curtailment of these functions.

This need for additional greenhouse space was finally alleviated with the opening of two new houses in April, 1974. These greenhouses are of the most modern type, manufactured by Lord & Burnham, Division of the Burnham Corporation of New York. The contract for the erection of the houses was awarded to the Nexus Corporation of Denver.

One of the greenhouses was purchased with funds bequeathed by the late Dr. John C. Long, a prominent Denver ophthalmologist, amateur botanist, and skilled photographer. Dr. Long's particular interest in the orchid family resulted in his authorship of the *Orchids of Colorado*, published in 1965 by the Denver Museum of Natural History. This greenhouse is 30 ft. wide by 80 ft. long (2,400 sq. ft.) and 18 ft. tall, presenting a total of 37,000 cu. ft. It is divided into four sections: rooms A, B, C, and a research compartment. Room A is designed to accommodate ferns and medium-sized tropical plants, with 14,000 cu. ft. and regulated mini-

mum daytime temperature of 66° F and minimum nighttime temperature of 60° F. Room B is used for orchids, bromeliads, and anthuria, with 14,000 cu. ft. of space and regulated minimum daytime temperature of 70° F and minimum nighttime temperature of 64° F. The potted plants are placed on wet gravel, with metal screens between the pots and gravel to prevent over-watering of the roots. Room C contains 9,000 cu. ft. of space and is used for cacti, succulents, and other zerophytic plants. Temperature regulation is set to maintain a minimum daytime temperature of 64° F and a minimum nighttime temperature of 54° F. The last section is 20 ft. by 30 ft. (600 sq. ft.) and is to be used as a plant research compartment when funds are available to complete the capital improvements.

The second greenhouse was built with funds collected over a three-year period by the Associates of the Denver Botanic Gardens. The money was raised through the Associates' Gift Shop and pre-Christmas sales. This greenhouse is also 30 ft. wide by 80 ft. long (2,400 sq. ft.) but is slightly taller (19 ft.) than the other greenhouse. The extra height is to accommodate large potted plants, which



Automatic Control Board



Extended Corridor

are transferred to the Conservatory or displayed in the Lobby Court when needed. To further increase the vertical space available, there are no permanently fixed benches in the large section. The temperature is regulated to achieve a minimum daytime value of 60° F and a minimum nighttime value of 58° F. In addition to this large section, there is a small (20 x 30 ft. or 600 sq. ft.) compartment for use in propagating both tropical and outdoor plants. This compartment has permanently fixed benches made of asbestos concrete, each having a clear plastic hood allowing for control of atmospheric conditions over each bench. Separate heat controls are provided for each bench, along with mist lines for cuttings or propagation of plants from seeds.

The separate compartments of both new greenhouses are equipped with perimeter steam heat and an overhead Modine heater, which provides quick heat when there is a sudden drop in temperature (not uncommon in Colorado). The fan in the Modine heater is also activated when the temperature in the compartment reaches that set on

the thermostat, resulting in circulation of air. The thermostats are high-low range aspirator types, with the thermostats set individually for the different requirements in each compartment.

With the added room provided by the new greenhouses the original greenhouses will be used for propagation of bedding plants for outside display, or plants for the lobby court, and of plants to become a permanent part of the outdoor collection.

An interesting feature of the new greenhouse construction is that the corridor of the headhouse of the old greenhouses is extended through the new greenhouses and is roofed with glass, permitting the use of this space more effectively for temporary housing of plants, and even to grow certain types of plants on a permanent basis, such as climbing vines. Temperature control in the new greenhouses is entirely automated. Controls in the old greenhouses were converted to the automatic system, too, when the new greenhouses were built. Now, several months since the automatic controls were installed, dramatic improvement can be easily noted in the appearance of the plants formerly grown under manual controls.



Associates Greenhouse (No.4)



the
genus
glen
COLUMBINE

Aquilegia caerulea daileyae

David J. Luebbers

When the Rev. Harold Gilmore assumed directorship of Geneva Glen Camp at Indian Hills in 1927, he dreamed of a dynamic camping program that would bring spiritual meaning to the lives of the nation's children. Geneva Glen Camp was ideally suited to his needs. Originally situated on 85 acres of forested mountain land donated by George Olinger, the camp sat in an isolated valley within view of Teddy Roosevelt's Cabin and the majestic Front Range. In earlier days, the Ute Indians rode through camp during seasonal migrations from high mountain valleys to the plains of Denver. The forest community included ponderosa pine (*Pinus ponderosa* Laws.), scrub oak (*Quercus gambelii* Nutt.) and grasslands on the south facing slopes; Colorado blue spruce (*Picea pungens* Engelm.) and Douglas fir (*Pseudotsuga menziesii* (Mirb.) Franco) on the north facing slopes; and aspen (*Populus tremuloides* Michx.), wild flowers and bushes along the streams. Hawks and owls searched out their prey as mule deer and elk grazed unmolested in the meadows below. It was in this untouched wilderness that Gilmore found the Geneva Glen columbine (*Aquilegia caerulea daileyae* Eastw.).

In the spring of 1931, Gilmore observed a columbine of unique form not formerly known to him or his associates. The spurless star-flower grew at his doorstep in the shade of blue spruce and Douglas fir at 7,000 foot elevation. Unable to find another specimen like it on his frequent hikes in the Front Range, he named it the Geneva Glen columbine. While its foliage was similar to the Colorado state flower (*Aquilegia caerulea* James), the long white spurs of the petals were entirely absent. The petals and sepals were ovate, acute, crinkled, flat and blue. As the adopted mascot of the camp, this rare columbine received continued protection from that moment forward. It persisted at the Gilmore Cabin for 42 years until it mysteriously disappeared in 1973 when Gilmore returned to Denver.

Fortunately, the Geneva Glen columbine can still be seen each May in a sheltered aspen grove just off the Sacred Trail above the old Ute Trail at 7,500 foot elevation. During the last 15 years, a few spurless columbines have been growing among Colorado blue columbine (*Aquilegia caerulea*), red wood lily (*Lilium philadelphicum* L.), coral root (*Corallorhiza maculata* Raf.), kinnikinnik (*Arctostaphylos uva-ursi* (L.) Spreng.), shooting star (*Dodecatheon radicum* Greene) and wild rose (*Rosa acicularis* Lindl.). An occasional salamander can be seen in the adjacent stream while a rufous hummingbird sits quietly on its nest in the lower branches of a Colorado blue spruce. Black-eared Aberts squirrels chatter in the spruce as red-naped sapsuckers and western wood pewees search for insects. At night the long-eared owl can be heard above the trickling water that upwells through the granitic forest floor on its tumbling journey to Parmelee Gulch below. In this private sanctuary away from horses and cars, perhaps 60,000 boys and girls from around the world have seen the Geneva Glen columbine in its natural setting. Hopefully, their grandchildren will have the same opportunity due to Gilmore's insight into conservation practices which would preserve the delicate environment that he held in trust for the next generation.

The Geneva Glen columbine has been occasionally sighted elsewhere in the foothills of Colorado. Not far from camp, Miss Anna L. Dailey collected specimens near Evergreen during the last century. She sent them to Alice Eastwood who first applied the varietal name *daileyae*. Eastwood also reported sightings in Waterton and Estes Park. E. G. Loder reported a spurless blue columbine composed of 10 sepals and no petals he found near Fairplay at 10,300 foot elevation. In 1879 seeds were sown in England, producing white flowers and other spurless flowers. George Kelly found the Geneva Glen columbine some 35 years ago just west of Devil's Head road, 4 miles south of



Crinkly petals and sepals.

the ranger station. Katherine Crisp discovered the flower growing in a canyon near Bailey some years ago. Spurless columbine appeared and has persisted at Ruth Nelson's ranch near Estes Park after she planted seeds from normal spurred columbine taken from slopes south of the Big Thompson Canyon east of Estes Park in 1926.

Despite these sightings, the elusive Geneva Glen columbine remains a mystery. Is it a sport and an endemic which will freely intergrade with other members of the species, destined to appear and disappear with each fluxuation in the genetic environment? Why did it disappear from the Gilmore Cabin the same year its renowned occupant moved to Denver? Who was Anna L. Dailey, and how did Alice Eastwood come to know her?

Despite the ravages of the depression, soaring real estate prices and the camp's non-profit status, the dream of 1927 has

been fulfilled. Gilmore's pioneering efforts to keep the foothills available to future generations of urbanites has succeeded, and the Geneva Glen columbine still shows itself to thousands of campers each spring.

Valuable information was provided by Richard Beidleman, Katherine Crisp, Harold Gilmore, Iris Gilmore, George Kelly, Ruth Nelson, Hazel Schmoll and William Weber. Important records were made available by the Denver Public Library, Denver Public Schools, Helen Fowler Library, Jefferson County Historical Society, Pioneers' Museum and the State Historical Society. A special thanks to Eileen Bloustein, Solange Huggins, Margaret Sikes, Helen Zeiner and the Denver Botanic Gardens, Inc.

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Exotics of COLORADO

Austrian Pine, *Pinus nigra*

Helen Marsh Zeiner

Coniferous evergreens play an important role in landscape design, particularly during the winter months when deciduous trees and shrubs are bare. Both Colorado evergreens and those from other states and other countries can be found growing successfully as ornamentals in Denver.

Austrian pine (*Pinus nigra* Arnold), an exotic, is one of the most attractive of the large conifers. Austrian pine at its best can be seen in Denver's city parks where it has space to develop properly.

As its name indicates, Austrian pine is a European tree indigenous to central and southern Europe and western Asia. In the United States it has been cultivated as an ornamental since 1759.

Austrian pine (sometimes called black pine) is one of the darkest green of all

evergreens, making it good for contrast. Its botanical name, *Pinus nigra*, is given to this tree because of the dark green needles and dark bark. *Pinus* is the ancient Latin name for all pines, while *nigra* means black.

In the Denver area, Austrian pine is sometimes confused with native ponderosa pine (*Pinus ponderosa* Laws), which is also planted as an ornamental. They are both long-needle pines of similar size and shape. There are, however, some distinct differences between the two trees.

Both Austrian and ponderosa pines have long needles in clusters of two or three occurring on the same tree. The needles in ponderosa pine are mostly in clusters of three, those of Austrian pine mostly in clusters of two. Austrian pine

needles vary from 3 inches to 6½ inches in length, those of ponderosa pine from slightly over 3 inches to as much as 10 inches. Ponderosa pine needles are typically yellowish-green, although they may sometimes be dark green. Those of Austrian pine are very dark green.

Cones when present are helpful. Generally, those of ponderosa pine are larger, but there is some overlap in size. Ponderosa pine cones range from 3 to 6 inches in length, those of Austrian pine from 2 to 4 inches. Ponderosa pine cones are reddish-brown, Austrian pine cones are yellow-brown. Differences in cone scales are more reliable than size or color. In ponderosa pine, the exposed part of the cone scale is flattened, in Austrian pine it is depressed and conspicuously ridged or keeled. Ponderosa pine cone scales bear stout recurved prickles, those of Austrian pine usually bear a very short prickle.

Young trees of both species have dark bark, but in old, mature trees bark is a good distinguishing characteristic. With age the bark of ponderosa pine becomes thick, brown, and separates into cinnamon brown scales or flat plates. That of Austrian pine becomes dark gray and is deeply fissured into longitudinal scaly plates.

Austrian pine is generally a denser tree, a characteristic especially marked in young trees.

Well-developed buds are reliable in separating the two trees. Those of Austrian pine are comparatively large, egg-shaped or turban-like, with light brown or gray scales tinged with white. The lower bud scales are loose and may peel back to form a rosette while the uppermost bud scales are held together with a white resin. Ponderosa pine buds are generally longer than those of Austrian pine, orange-brown in color, and less resinous.

Austrian pine is a very popular large ornamental tree because of its dense, dark-green foliage and the symmetrical form of young trees. It has proved to be very hardy and it will grow in almost any type of soil provided the drainage is

good. In its native habitat, it is a valuable lumber tree. In the United States, however, it is not grown for lumber but rather as an ornamental. It is also used for windbreaks or, because it grows fast, for fixing sand dunes.

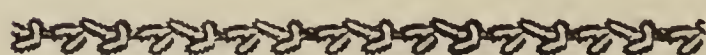
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The editor's apologies. The author of "Japanese Garden Tour" in the Fall issue of *Green Thumb*, page 91, is Mrs. E. Atwill Gilman, not Mrs. Atheril Gilman.

In the same issue "The Wyeth Bowl" article on page 81 concerning the bowl's presentation to Denver Botanic Gardens by Dr. John R. Durrance in honor of six dedicated women should have named Mrs. Frank McLister, not Mrs. Harry B. McLister.



Plant

Travelers

Marjorie L. Shepherd

Supermarket bins display glowing oranges, golden ripening bananas, bronze grapefruit, yellow lemons, the soft gold and blush of the peach. The herbs of dark green parsley and green tips of asparagus contrast with gleaming white onions. The grocery market spice cabinet holds small cans of sage and thyme. Enticing as these are to the palate, their romantic past is even more intriguing to the mind.

The plants and trees which produce food for the peoples of the world are often ancient and have traveled during many centuries until their origin may not be known. Man has had much to do with their distribution. Nomadic tribes once wandered the earth and probably did plant and harvest some plants for food. Seed traveled with them from place to place leaving some remnants to become naturalized.

Peaches were introduced to Asia Minor and Europe from Persia about 300 B.C. They were cultivated in China from very remote times and probably were carried to Persia by way of the old Bokhara trade route.

Rumors of the wealth of China and of the Indies reached Europe and

created a desire to trade with these lands. The era of navigation was inaugurated by Prince Henry, the navigator, in 1418. The Portugese reached China by sea in 1516 and took back with them to their settlements in India the sweet orange. Later, this was introduced into Portugal and may have been the first plant taken to Europe from China.

By 1520 the Portugese sailors were sailing to India and Malaysia by way of the Cape of Good Hope or Cape Horn, stopping at Brazil for supplies. The Spanish sailors stopped for provisions in Mexico before setting out across the Pacific. Thus, many plants traveled from Brazil and Mexico westward across the Pacific. The English and Dutch East India Companies were formed in 1600 and 1602 respectively and a regular traffic in the more useful and beautiful of the plants of China and Malaysia was maintained.

Joseph Banks, the English Botanist, accompanied Captain Cook on his trip to observe the transit of Venus in 1768 with their destination Tahiti. Of the

fresh food they used from the Pacific Islands, much mention is made of plantain and breadfruit. Sometimes they lingered long enough to plant gardens.

David Nelson, who had been the botanist of Cook's last ill-fated voyage, was appointed by Sir Joseph Banks to accompany Captain Bligh on the famous trip of the "Bounty." The ship was fitted for use of the transport of breadfruit trees to Jamaica and other islands in the West Indies, to be grown for cheap food for the slaves.

A false floor was built in the great cabin of the "Bounty" with holes designed to hold pots of plants. The true deck was covered with a sheet of lead so the fresh water which drained from the plants could be used again. By March, 1789, David Nelson and his assistant had collected about one thousand breadfruit trees and others thought to be valuable. These were destroyed during the mutiny.

When the colonists came to America their botanist-medical doctors brought medicinal herbs and seeds from the old world to become part of the gardens here. These, together with native edibles, are the ancestors of our modern gardens along with travelers from the far corners of the world.

For the source of citrus fruits and bananas we owe much to the people who started the travel of plants from Southeastern Asia on their way around the world. Especially, we should remember the gardens of China which existed before recorded history.

The study of the travel of plants is a fascinating subject about which much has been written. It is also controversial as shown in the following quotation from "The Botany of Cook's Voyages" by Elmer D. Merrill:-

"As a rule, even weeds, much less the cultigens, do not extend their ranges from one hemisphere to another without the intervention and aid of man. This situation should be realized even by those who do not understand the elements of botany, and who

publish superficially impressive papers providing what they want to believe."

Today, the edible products of the plants and trees have been bred for looks, keeping qualities and flavor. They are brought to you from the far corners of the world by way of our modern transportation systems. The fruits and vegetables in your supermarket make a colorful display and each one has an interesting tale.

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Holiday Gift Plants

and Their Care



Helen Marsh Zeiner

Plants are popular gifts during the Christmas season. They will stay beautiful longer if you give them proper care.

The poinsettia is a universal favorite, and the red poinsettia has been a traditional Christmas gift plant for many years. Now poinsettias in soft shades of pink, rose, and creamy white are competing with the traditional red. The showy “flowers” of poinsettias are not true flowers but instead are brilliantly colored modified leaves or bracts. The true flowers are the inconspicuous clusters of yellow in the center of the colored bracts.

Today’s poinsettias have been greatly improved over the original varieties. They are much more compact and sturdy, and they hold their “flowers” and leaves for a longer period of time.

A poinsettia which has come from a warm, moist greenhouse must adjust to the dry air of the average home. Leaves may turn yellow and drop because the change is too great.

To assure maximum pleasure from a poinsettia, as soon as it arrives from the florist place it in a sunny location away from drafts, keep it uniformly moist, and allow no sudden changes in temperature. With good care, a poinsettia should remain beautiful for a long period of time.

It is normal for poinsettias to drop their leaves sooner or later, although new varieties may hold their leaves

almost indefinitely. Once the leaves have fallen and the plant is no longer attractive, you have a choice of discarding the plant or holding it over for use another year.

If you wish to keep the plant, move it to a cool, dark basement and water lightly only every two or three weeks. This is a dry resting period.

In May, cut the plant back severely, repot in a fairly light soil containing a good proportion of humus and of sand or vermiculite, and sink the pot to its rim in a sunny part of the garden when danger of frost is past. Be sure that the plant is watered during the summer.

In August, prune as necessary to shape the plant. Bring the poinsettia indoors early in September before the nights become cold. Start a regular watering program and feed with plant food of your choice about once a month until after blooming.

Poinsettias are short-day plants and should receive no more than 12 hours of light in order to set buds. This can be achieved by covering the plant with an opaque cover such as black cloth or a cardboard box in the middle of the afternoon and leaving it covered until the following morning. Once buds have set, the cover can be discarded.

Even with such treatment, poinsettias will not always bloom under the conditions in the average home. They are still attractive foliage plants which add

variety to the window garden and which are useful as background plants for smaller plants.

The azalea is a gift plant which can be kept for several years. With proper care, it should bloom once a year, often very freely.

Azaleas are plants of temperate climates and they prefer cooler temperatures than those found in the average home. As long as there is some sun, keep the azalea in as cool a location as possible. One reason azaleas fail to bloom is too high a temperature.

Azaleas need to be kept evenly moist. A good way to water an azalea is to stand the pot (which has a drainage hole in the bottom) in water until it soaks up through the soil and the top of the soil is wet. Then remove the pot from the water and allow the surplus to drain away before returning the pot to its saucer. Never allow an azalea to stand in water any longer than it takes to soak the soil.

Spray the foliage often. This is important.

Azaleas need an acid soil. When potting an azalea, add an extra handful of peat to the potting soil. To maintain acidity in the soil, add a quarter of a teaspoonful of iron sulphate to the soil about once a month. Lacking iron sulphate, water about once a month with a solution of half a teaspoonful of vinegar to one quart of water. Apply to soil which is already moist.

Feed about once a month. Special plant foods for acid loving plants are good, but any commercial plant food may be used.

Azaleas will benefit from a summer outdoors. Sink the pot in a semi-shady spot and keep well-watered.

Red-fruited Christmas peppers and Jerusalem cherries are appealing gift plants. These plants are sometimes confused because they both have red fruits. Although they are both members of the potato family, *Solanaceae*, they are entirely different plants. Christmas peppers belong to the genus *Capsicum*,

Jerusalem cherries to the genus *Solanum*.

Christmas peppers are edible, but they may be fire-hot. One variety is known as tabasco pepper. Tabasco sauce is made from peppers such as these. Candle peppers have tiny bright red fruits borne upright and thus resembling red candles. These are the most popular of the several varieties of Christmas peppers.

Christmas peppers are best treated as annuals. Keep the plant out of drafts in a cool, sunny spot. The soil should be kept evenly moist — neither wet nor dry.

When the pods are dry and wrinkled, they may be picked for seed. Seed sown in July should produce fruits by Christmas. Start seeds in sandy potting soil and transplant as needed. Sink the pots outdoors after danger of frost. They should be in a sunny part of the garden. Be sure to bring them indoors before frost.

The orange-scarlet fruits of Jerusalem cherry are round and cherry-like in appearance. They should be kept away from children and they should never be eaten, as they are toxic.

Jerusalem cherries grow well in a cool but sunny window. If the temperature is too high or the air is too dry, the plant may drop its leaves. Drafts will also cause leaf drop.

Jerusalem cherries should be drenched and then allowed to dry until the soil feels slightly damp before watering again. Never allow them to become completely dry.

Jerusalem cherries can be grown from seeds planted in February or March. Pick fully ripe "cherries" for their seeds. They can also be treated as perennials. In this case, rest the plant by decreasing water after the fruit has fallen or withered. Do not let the soil become completely dry, however. After a month or six weeks, prune the plant back, syringe frequently to help bring the plant into active growth, and resume normal cultural practices.

The National Junior Horticulture Association

Virginia Shaw

"A lot of people pot plants, but it's surprising how few know the *proper* way to pot a plant," says fourteen year-old Eric Umbreit.

Eric and some forty other young people belong to the NJHA: the National Junior Horticulture Association. Local members of the NJHA have congregated, naturally enough, in Horticulture Hall at the Denver Botanic Gardens for their second annual "Workshop and Contest."

"Speeches and demonstrations have been added to the events in our workshop this year, and they are judged on their quality," continues Eric. "Today I will give a demonstration, very simple, but..." He smiles and goes on to explain the proper method of transplanting. "You place one hand on the top of the original pot and, holding the stem of the plant between the first and second fingers, you turn the pot upside down. Next you tap the rim of the pot on the edge of a table, say, so the root ball and surrounding soil slide out. Now that the plant has been removed from its container, take a sharp knife and shave off a few inches of the root ball (one inch will do for a small plant, 4 inches for a large one). This helps prune the roots and remove old soil. Next unwind and cut off large roots that encircle the outside of the root ball. Then, to assure proper drainage, put an inch or so of gravel in the bottom of your new container. If you put a few small pieces of clay from a broken pot with the gravel, the gravel will not pack together. Next, you fill the container half full with new soil and place the

plant in the pot, making sure it is centered. Finally, add more soil — within a half inch of the top — to the pot and pack it around the plant."

Though Eric is but fourteen, he has already decided what he will study in college. "I will probably go into the field of forestry as a landscape architect and sprinkler contractor. I've always liked sprinklers..."

The girl sitting beside Eric laughs. She is Pegi O'Neill, sixteen, and she has been helping Charles Urano, this year's head of the NJHA in Colorado, to seat members as they come into Horticulture Hall. "I am delivering a speech on processed shale revegetation," she says. Wow! And she knows what she is talking about because she has been to the Environmental Colony Department for research, worked with a teacher at her school, and done a lot of reading. "You see," she says, "Erosion-level is so high in shale-ash that seeds get uncovered. Shale-ash is very alkaline due to a lack of nutrients, and cementation occurs. "But," she explains, "it has been found that processed-shale — shale mixed with soil, for example — will hold life. For some time, fields containing processed shale have lain barren. But now they have discovered that wheat can be grown in these fields. I believe that many kinds of crops can actually be grown."

While Pegi has an interest in controlling erosion, she also works to beautify the environment: Pegi is head of the Community Garden Spot, an activity which has been organized by her 4-H club. The original 'Spot,' once a

vacant area, is now a large vegetable garden adjacent to a shopping center. The area was donated to Pegi's 4-H club by local merchants. More of these 'spots' can be developed through the Garden Spot's work. Vacant areas can be used by interested persons for growing flowers and vegetables, and they may call Pegi for information. Those who tend the garden can then take home their produce.

To help create citizens with an understanding of the environment's needs is one of NJHA's objectives. Through speeches and demonstrations, some of the members in this year's "workshop and contest" have been tested for their knowledge of horticulture.

Not all of the year's participants have had to prepare a talk or demonstration, but all have had to take three kinds of tests: a written test, identification of plants and ornamentals, and "judging." In this last category, the participant looks at four different specimens of the same fruit or vegetable and then judges their quality on a scale from "good to bad."

The NJHA also sponsors contests called the "Young America Horticulture Contests" for those children who are too young to participate in the NJHA projects. Plant Propagation, Experimental Horticulture and Environmental Beautification are among the Contests. Enrollment cards and information for Young America Horticulture Contests may be obtained by writing to the Colorado NJHA headquarters.

This year's NJHA "Workshop and Contest" was divided into two divisions, junior and senior, of young people from the different Colorado counties. The junior division includes the ages from nine to thirteen, while the senior division includes those from fourteen to nineteen. If the money is raised, those senior members with the four highest scores will then go on to the national meeting in Washington, D.C. from November 1-5.

Clearly, membership in the NJHA is one of those special "extra-curricular activities" that promote a fertile mind. Whether horticulture is pursued as a profession-for-the-future, or as a hobby, it is truly a growing experience.



Gifts and Bequests

Lifetime and testamentary gifts to the Denver Botanic Gardens are deductible in computing both income and death taxes. The Trustees ask anyone who wishes to add to the Gardens' limited resources to consider making a gift of either real or personal property during life, or a bequest or devise by will. Such disposition can be made specifically either for the Development Fund or the Endowment Fund or both. The proper designation of the recipient is *The Denver Botanic Gardens, Inc., a Colorado Corporation*.



FORM for GIFT or BEQUEST

I hereby give ☐ bequeath ☐ to The Denver Botanic Gardens, Inc., a Colorado Corporation, a non-profit, educational institution, the following:

Endowment Fund, Amount:_____ Development Fund, Amount:_____ to be applied for the purposes of The Denver Botanic Gardens.

Name _____

Address _____

City _____ State _____ Zip _____

Signature _____ Phone _____

New Assistant Director, Mr. Glenn M. Park,

Arrives at Denver Botanic Gardens

The Denver Botanic Gardens takes pleasure in welcoming its new Assistant Director, Mr. Glenn M. Park. Mr. Park assumed his position on October 16, 1974, coming to Denver from the Botanic Garden of the Chicago Horticultural Society. He is replacing Mr. Andrew R. Knauer who left on July 1, 1974, to take the directorship of Bayard Cutting Arboretum on Long Island, New York.

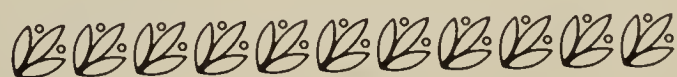
In Chicago, Mr. Park held the position of Chief Horticulturist and Superintendent for the Chicago Botanic Garden. This is a new garden, still under construction, and located near Chicago at Glencoe, Illinois. Mr. Park will, therefore, not be facing a new situation in Denver where the reconstruction of the garden area is still continuing. In Chicago the new Assistant Director was also closely associated with the planning and setup of the well known annual Chicago Flower and Garden Show. At the Botanic Garden he designed and supervised the installation of the impressive Home Landscape Display Garden. He was also involved with the initiation of the Adult Education Program in Chicago's Botanic Garden and gave workshops and lectures on a variety of horticultural subjects. Mr. Park supervised a sizable staff of workers at the Chicago Garden and was responsible for their programs of weed, insect and plant disease control. He has written several brochures about pest problems and various other garden subjects. Another of Mr. Park's duties in Chicago was to provide answers to horticultural problems requested by home owners and amateur gardeners.

The new Assistant Director was born in Illinois but spent over twenty years of his early life in Minnesota. He received a Bachelor of Science degree in

Forestry and Horticulture from the University of Minnesota in 1959. He worked with the U.S. Forest Service in Montana in the summers of 1952-1959 where he was actively involved in the white pine blister rust control program and the forest fire program. During this time he also supervised crews of 15 men in timber cruising. From 1960-1968 Mr. Park served as Nursery Supervisor at the Chalet Nursery in Wilmette, Illinois. Here he supervised all operations connected with a retail nursery operation — planting, transplanting, pruning, spraying, irrigation, drainage and selling. He was responsible for purchasing, pricing, and inventorying of plant materials for the Garden Center Nursery Division and the Landscape Division, also acting as "Plant Doctor" for the Garden Center. He designed the landscaping for various homes and schools in Chicago's suburban North Shore area. From 1968 to the present time he has been on the staff of the Chicago Horticultural Society and their new Botanic Garden.

Mr. Park is a member of the American Association of Botanic Gardens and Arboreta, American Horticultural Society, American Rhododendron Society, the International Shade Tree Conference, the International Plant Propagator's Society, the Illinois Nurseryman's Association, and the Illinois Landscape Contractor's Association.

Mrs. Park (Helen) will join her husband in Denver in the near future. His special interests in gardening are with roses, chrysanthemums, rhododendrons, and viburnums. Hobbies he likes to pursue when time permits are furniture building and refinishing and photography.





S.R. De Boer (1883-1974)

On the last page of his book, *Around the Seasons in Denver Parks and Gardens*, S. R. DeBoer wrote: "Ahead lies the bright unknown."

Mr. DeBoer has gone on ahead, just as he has always gone on ahead, leading us toward the bright unknown of more beauty and a better world. On August 16, 1974, he died, after 90 years and 11 months of dedication to the ideals of beauty and service. He had never lost his capacity for the big vision, the better plan, the dream of what can be done to improve our environment.

From his youth in the Netherlands and the beginnings of his career in Denver, all charmingly described in his life story, "Plans, Parks and People," published in *The Green Thumb* in the December, 1972 issue, to his last days, he was always thinking of how to make the world a better place to live in. Out of his thinking had come Denver's parks and parkways and much of its best landscaping. And out of his dreams and work had come the reality of Denver Botanic Gardens.

His dreams and plans were never impractical; most of them became realities. Some were never realized, but as time goes on, it is evident that S. R. DeBoer had seen what was needed. He had that most valuable faculty of combining pragmatic practicality with vision.

In Wyoming, New Mexico and Utah, as well as Colorado, there are enduring evidences of Mr. DeBoer's wise planning. Denver, Grand Junction and Boulder City are different places because of his work. The course of landscape development in the West has been strongly influenced by this man and generations to come will be indebted to him.

Denver and the West will miss this pioneer landscape architect, his friends will miss the quiet man and his old world dignity. He spoke softly, in a slow, careful manner. He was courteous and kind. He lived modestly, worked hard, inspired others.

Wrote S. R. DeBoer: "My boyhood dreams of designing bridges to span the canyons of the Alps never materialized; but, if my scribbles, my words, and my hopes have led toward bringing beauty to the treeless cities and plains of Colorado, I will be satisfied."

Wes Woodward

It was a strange coincidence that Frances White Novitt, long time associate of Mr. DeBoer's in landscape design, and illustrator of his book, died two days after Mr. DeBoer's death. Frances was, at the time, a valued member of Denver Botanic Gardens Publication Committee.

Frances White Novitt

(1918-1974)

What a joy to recall the many contributions to the beauty of Denver by this talented lady landscape architect.

Mrs. Novitt had degrees in Fine Arts and Anthropology from the University of Denver. Her experience as a landscape architect was obtained by working for eighteen years in the office of S. R. DeBoer, City and Park Planner and Landscape Architect of fine reputation. They were very good friends and due to Frances' patience and devotion, she was able to persist in getting Mr. DeBoer's memories recorded during his last two years when he was very frail. So it was quite remarkable that they passed on to their next assignments within two days of each other. Their memorial services were held the same day, August 20, 1974.

She was a student of the great artist and philosopher, John E. Thompson. She made the delightful pen drawings illustrated here, for the book by S. R. DeBoer, *Around The Seasons in Denver Parks and Gardens*, published in 1948, in which the beauties of Colorado have been sincerely and charmingly described and illustrated.

Frances Novitt worked in the Denver Parks Department intermittently from 1949 - 1969 and, for most of those years, designed the many flower displays in the Denver Parks and Parkways. She was on the Editorial Board of the *Green Thumb* 1963 - 1974. A very active member of the Colorado Mountain Club, she loved skiing and hiking.

A lovely memory I shall always cherish is of this very special lady.

Jane Silverstein Ries



THE GREEN THUMB

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The Green Thumb

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Botanic Gardens House

Denver Botanic Gardens maintains a collection of living plants, both native and exotic, for the purpose of acquiring, advancing and spreading botanical and horticultural knowledge.

DENVER BOTANIC GARDENS

ANNUAL REPORT FOR 1974



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COVER

*Bristlecone Pine at Timberline,
Mount Goliath*

ANNUAL REPORT FOR 1974

Prepared and Published by
Editorial Committee
and

Denver Botanic Gardens Staff

DENVER BOTANIC GARDENS

Janet L. Wingate, Ph.D.
F. H. Wingate, Ph.D.
Co-Editors

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*Fountain
and
Herb Garden*

DENVER BOTANIC GARDENS

1974

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*Mr. Andrew R. Knauer	<i>Assistant Director</i>
Mr. Glenn M. Park	<i>Assistant Director</i>
*Mr. Ernest A. Bibee	<i>Conservatory Superintendent</i>
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*Eugene Schaetzel	<i>Utility Worker</i>
Robert Trevethan	<i>Gate House Attendant</i>

*Left the agency before the end of the year.

Office

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Ruth Hawkins	Clerk Stenographer, Secretary to the Director
Helen McCloskey	Receptionist
*Jean DeWoody	Clerk Typist
Eleanor Smith	Clerk Typist

**Left the agency before the end of the year.*

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Dr. D. H. Mitchel	Honorary Curator of Mycology
Mrs. J. V. Petersen	Honorary Editor of <i>The Green Thumb</i>
Dr. Helen Zeiner	Honorary Curator of the Kathryn Kalmbach Herbarium



View of Conservatory from Outside Plantings

Denver Botanic Gardens

PRESIDENT'S REPORT 1974

It is a great pleasure for me to have this opportunity to report to the membership, on behalf of the Trustees of Denver Botanic Gardens, on the results and the activities of the past year.

During the year our Assistant Director, Andrew "Andy" R. Knauer, was offered and accepted the position of Director of the Bayard Cutting Arboretum on Long Island, New York, and we have welcomed Glenn M. Park as the new Assistant Director. His experience and training already are adding a great deal to our program.

Attendance has continued to grow although at a slower rate due to the curtailment of school trips and travel as a result of gasoline shortages. Our gate count was 230,225 as compared with 213,723 in 1973.

It is a pleasure to report that membership in Denver Botanic Gardens stood at 2,359 as of the end of the year. This is approximately an 18% increase from last year, which is most gratifying. Total dues income for the year amounted to \$32,147 which is highly valued support of our program, although a substantial part of this rightfully is devoted to publications, such as, *The Green Thumb* and *The Green Thumb Newsletter* which are sent to our members. We are hopeful that this membership will continue to grow, especially as more and more of our facilities are brought to the point where they may be opened to the public. As no admission charge is made, the support of members will be necessary to continue this development.

Membership income, like the contributions received from individuals, businesses, and foundations, is vital to the continuance of our capital improvements program which calls for completion of the walks, waterways, and plantings in the Gardens. This support supplements the funds provided by the City & County of Denver for basic maintenance.

During the past year, the City appropriation for this purpose amounted to \$427,900 and obviously is essential for the Gardens' continued existence. It is encouraging that the State of Colorado, recognizing the contribution made by such City agencies, for the first time this past year has contributed to the maintenance of this program by an appropriation to the City through the Colorado Council on the Arts and Humanities. A study of the possibility of instituting an admission charge at Denver Botanic Gardens was reported last year at this time. As long as this type of support on the part of the State is provided the City, it would appear that an admission charge would not be appropriate.

Construction under the Master Plan of Development has proceeded at a gratifying pace. A substantial amount of new walkways were completed in the west end and in the Charles C. Gates Memorial Garden; a small shelterhouse, or gazebo, was constructed near the large semi-circular pool in the north-central part of the Gardens; the view-mound, which recognizes the contributions of Mrs. Anna R. Garrey toward the founding and development of

Denver Botanic Gardens, was completed; and many of the plantings toward the east end began to take shape. Currently, bids are being let for construction in a large area in the southwest part of the Gardens, which in time will be a beautiful addition. This is being funded to a great extent by a very generous gift from the Associates of Denver Botanic Gardens. It is hoped that the plantings in the central gardens will be completed for the most part this summer and opened to the public. Also progressing are the west gate and gatehouse which will provide a link with Cheesman Park.

Much of the above was accomplished as a result of the successful conclusion of Phase II of the Development Fund "War of the Roses" which exceeded its goal of \$100,000 by \$707.65 with an additional \$5,000 pledged. I would like to be able to say that this completes our fund raising, but unfortunately I believe that will never be the situation. Inflationary forces and additions and improvements to our Master Plan have continued to make financial demands which have been met through the generous support of individuals, foundations, and corporations who have assisted in our development and hopefully will continue in the future.

Completion of the two new greenhouses, which were dedicated on April

20, 1974, although mentioned in this report last year, should not be overlooked, and our thanks are expressed again to the late Dr. John C. Long and to The Associates of Denver Botanic Gardens, in whose names the two greenhouses were dedicated.

We wish to express our continued gratitude to the Mayor and City Council, to the Manager of Parks and Recreation and his staff, to our own loyal staff, and to the hundreds of volunteers — the Associates, the Guild, the Around the Seasons Club, the Garden Club of Denver, who literally have provided thousands of hours of volunteered time — all of whom are responsible in great measure for the progress which should be becoming more and more visible.

We fortunately can conclude on an optimistic note as we look forward to the future. If we can sustain the momentum which has been developing, we soon will have all of the York Street Gardens planted and serving their intended purpose, of education and enjoyment; we will be able to devote increased efforts to our educational and research programs at the Denver, Mount Goliath, and Bear Creek Units; and we may direct more and greater attention to the planning and development of the Chatfield Arboretum.

John C. Mitchell
President



1974

DIRECTOR'S ANNUAL REPORT

The following series of short articles comprise the report of the Director on numerous aspects of the total program of the Denver Botanic Gardens during the year 1974. Many interesting details have had to be omitted to conserve space.

The Director is pleased to use this opportunity to emphasize that the progress of the Gardens during the past year is the result of an outstanding group effort on the part of the City and County Officials and the Department of Parks and Recreation, in addition to the Board of Trustees, the Membership, the Volunteers and the Staff. He wishes to express his deep gratitude for the contributions of all these groups.

Dr. William G. Gambill, Jr.
Director



New Greenhouses

Construction and Development of Physical Facilities

The completion of two new greenhouses in April, 1974, more than doubled our capacity for growing plants under glass. Funds for the new greenhouses were provided by the late Dr. John C. Long, a prominent Denver ophthalmologist, and the volunteer organization, The Associates of Denver Botanic Gardens. The combination of additional space and more modern automated environmental controls in the greenhouses (both new and old) resulted in dramatic improvement in the condition of plants. The corridor of the headhouse of the original greenhouses was extended through the new greenhouses and roofed with glass. This permits the more effective use of this space for temporary housing of plants and for growing certain types of plants, such as vines, on a permanent basis.



Dedication of New Greenhouses

In June, a new roofed patio with concrete floor was completed north of the Children's Garden shelter. New benches were installed in the shelter and a coat of paint added. The shelter provides a much needed dry, shaded area for classes and other gatherings for children and supervisors working in the garden. During April and May a new and more efficient irrigating system was installed in the Children's Garden.

In August, Schedule C of Phase IV of the walkway construction program was completed. During the summer construction period, over 12,500 sq. ft. of walkways were poured in the north-central and western portions of the Gardens (mostly in the Plains Garden and adjacent areas). Some new patterns of cobble walkways, designed by a Botanic Gardens staff member, have been used and are very attractive. These walkways will make it possible to establish the final grades in the areas of the Gardens where they have been placed and this step in turn can be followed by planting.

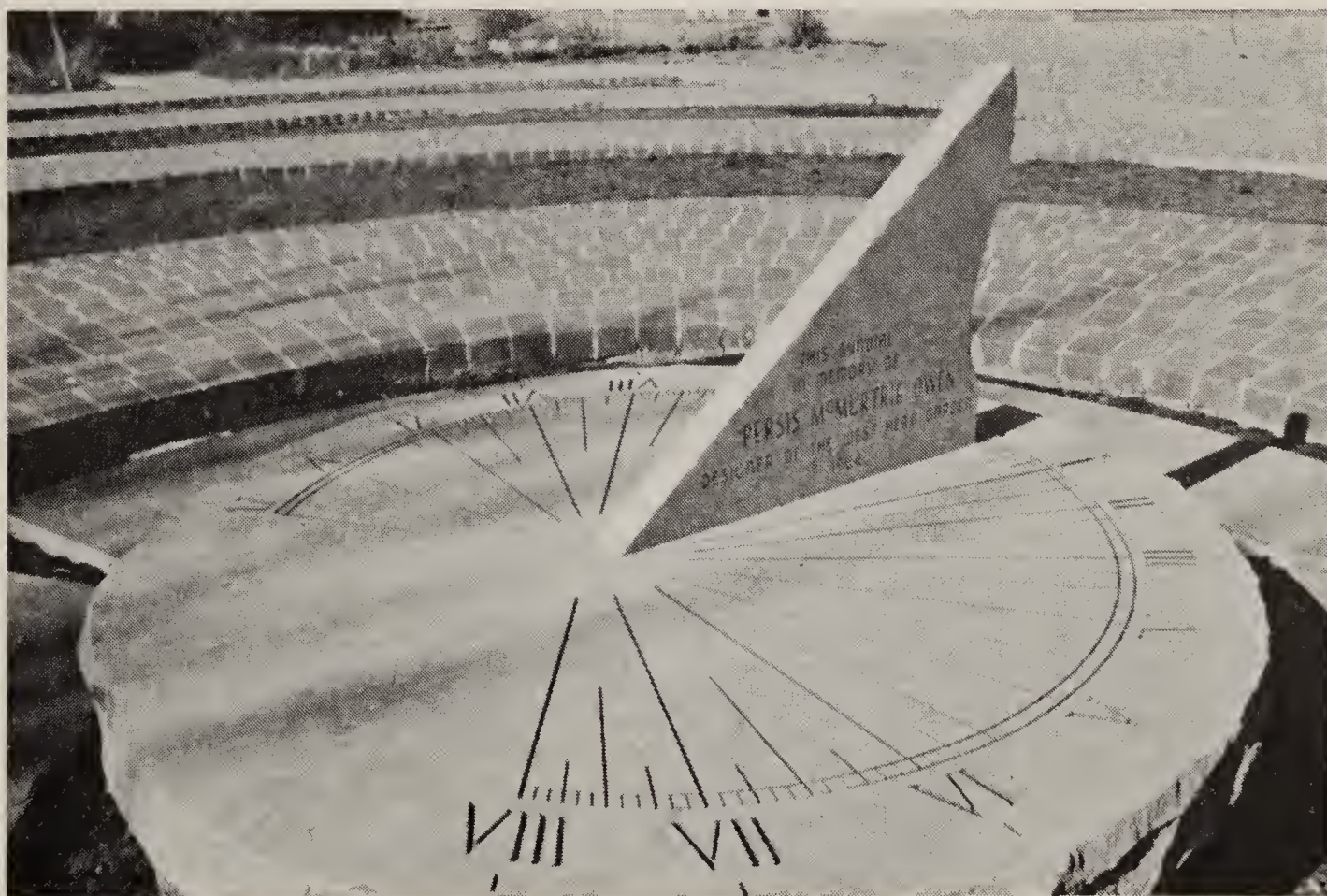
Construction of the outdoor amphitheater was completed this past year with the laying of the floor, using 3 ft. square blocks of red Colorado quartzite-sandstone, and the installation of floor drains. Spaces between the floor blocks were planted with lemon thyme which will provide a grid of soft green growth.

An observation and meditation site on the Gardens grounds, named "Anna Garrey's Overview", was completed in 1974. This consists of a raised mound, known earlier as the View Mound, with concrete steps from base to top and a concrete pad on top. At the center of the pad is a low concrete pedestal supporting a single block of quartzite-sandstone 5 feet square. This serves as a bench upon which one may rest and observe the view of the Gardens with the mountains in the distance. Included in the construction is a sprinkling system, also completed in 1974. Funds for the steps and the bench were contributed, in part, by family and friends of Mrs. George H. Garrey, to honor her as one of the pioneers in the establishment of the Denver Botanic Gardens.

The brick-laying of the Herb Garden extension was completed and a drinking fountain and sundial, a memorial to Mrs. Persis M. Owen, were installed.

Construction of a hexagonal gazebo, partially surrounded by the lower pond of the ornamental water system, is now essentially complete except for the installation of a handsome all-year drinking fountain and the installation of benches around the inside of the gazebo. It is being built of red cedar, with a diameter of 20 feet and a height of 8 feet at the edge of the roof, rising to 12 feet in the center. The gazebo should be a welcome stop for visitors as well as a focal point in the approach from Cheesman Park. Funds for this construction were provided by the Associates.

A major relandscaping job north of the flagpole in the parking lot and along both sides of the broad steps leading from the parking lot down to York Street, was completed in September. This area, originally landscaped a number of years ago, had become infested with weeds. During the summer, the upper 10 inches of soil,



Sundial in Herb Garden

along with all weeds and old juniper plants, were entirely removed, and new soil, sand, and compost were spread over the area following several weeks of intensive weed eradication. The thoroughly prepared soil was covered with a layer of new Merion grass sod and the transformation of the appearance of this area was immediately gratifying. Plantings of shrubs will be installed at a later date.

Several projects of maintenance were performed on the Botanic Gardens House (designated an official City Landmark) during the year. Needed paint was applied to outside wood trim, window frames, doors, rain gutters, downspouts, window, and door screens of the house and garage. Some carpentry repair was required on wood sills, screens, and some window frames. The back porch has been subject for many months to settling of its brick foundation, and this was repaired. A large section of the concrete paving adjacent to the porch has also settled. This was removed and a water drainage problem was discovered and repaired. All the soggy soil below the concrete was excavated and hauled away. Over 70 tons of "road base" were brought in to fill the depression. This was then thoroughly tamped and the new concrete laid.

Considerable change has been made in the Conservatory plantings. In the northwest corner, an area has been set aside for plants of arid habitats, centering around a 12 foot *Aloe* tree and including numerous succulents from the greenhouse collection. This provides an interesting new aspect to the Conservatory, otherwise devoted to mesophytic and epiphytic tropical forms. Another change in the Conservatory is the addition of a new display area immediately inside the maintenance entrance from the shop area. This required the installation of several small terraces, supported by large chunks of New Mexico lava. The terraces were filled with sand, and provided with openings in which containerized plants may be exhibited on a rotational basis. Several large banks of fluorescent tubes were installed to provide additional lighting for the area.



View of Conservatory from "Anna Garrey's Overview"

Plantings and Acquisitions

A donation of 16,892 bulbs, representing 71 varieties of spring-flowering plants, was received from the Netherlands Flower-Bulb Institute of New York in October, 1973. These bulbs were planted and studied throughout their period of flowering in 1974 from February to late June, and extensive data on flowering were submitted to the Netherlands Flower-Bulb Institute for incorporation into their climate adaptability study. Results of this study were published in the Autumn, 1974 issue of *The Green Thumb*. In the fall, an additional 4,730 bulbs, representing 39 varieties, were planted and these will flower during early 1975. An additional donation by the Netherlands Flower-Bulb Institute of 4,750 tulip bulbs, representing 22 varieties, was planted in the fall and will bloom in 1975.

A total of 9,300 annuals was planted in display beds along York Street, in the parking lot area, around the Botanic Gardens House, and in some sections of the main gardens. Several All-American Selection varieties were used, along with some varieties new to the Gardens and several test varieties.

Added to the outdoor water garden were 16 varieties of tropical water-lilies, including the giant *Victoria regia*, plus 3 varieties of *Lotus*.

To the All-American Rose Selection test gardens 144 plants were added representing 18 hybrid teas, 4 grandifloras, 10 floribundas, 3 climbers, and 3 miscellaneous. These will be retained for 2 years, until 1976, for testing.

Plants added to existing collections in 1974 included 57 new day lily varieties in the Hemerocallis garden, an official display garden of the American Hemerocallis Society, bring the total there to 350 varieties. To the iris garden were added 55 varieties of miniature dwarf bearded iris and 42 varieties of Siberian iris.

New display gardens established in 1974 include a dahlia display garden started by the Denver Dahlia Society with 275 plants representing 195 varieties. Also new are a rose display garden with 170 plants of 11 varieties and a peony planting consisting of 13 varieties.

Additions of trees and shrubs to the outdoor gardens in 1974 include spruces, junipers, oaks, lilacs, and representatives of the rose, honeysuckle, dogwood, pea, sumac, staff-tree, saxifrage, and St. Johnswort families.

New plants added to the greenhouses and conservatory collections include 54 varieties of bromeliads, 142 varieties of orchids, 63 varieties of cacti and succulents, and 127 miscellaneous varieties.



Education Program

In 1974 the number of courses offered by the Denver Botanic Gardens increased to 36, with an enrollment of over 1,400. Subjects ranged from horticulture and botany to special hobby or study topics involving plants.

Horticulture: Home Landscaping (Mr. Knauer and Mr. Rollinger); Pruning (Mr. Knauer); Ground Covers (Mrs. Hyde); Summer Lawn Care (Mr. Boyle); Vegetable Gardening for the Denver Area (Mr. Gundell); Hydroponics (Mr. Novitt); Gardening on Your Lanai (Mr. Hannigan); Advanced Tropical Plants for Home and Garden (Mr. Bibee); House Plants for the Amateur (Dr. Zeiner); House Plant Clinic (Mr. Hannigan).

Botany: General Botany (Dr. Denham — day); General Botany (Dr. F. H. Wingate — night); Meet the Grasses (Dr. Zeiner); Soils and Plant Growth Relation (Dr. Feucht); Identification of Woody Plants (Dr. Feucht); Identification of Common Mushrooms (Mr. Grimes); Tropical Fruits (Mrs. Shepherd); Use of Latin in Botany (Dr. Gambill); Biological Illustration (Dr. J. L. Wingate).

General: Dried Flower Arrangement (Mrs. Kosanke); Beginning Flower Arrangement (Mr. Ashley); Advanced Flower Arrangement (Mr. Ashley); Bottle Gardens (Mr. Hannigan); Bonsai for Beginners (Mr. Fukuma); Intermediate Bonsai



Plant Identification Field Trip

(Mr. Fukuma); African Violet Workshop (Mrs. Lahr and club members); Rose Symposium (Mr. Lahr and club members); Dahlias (Mr. Mentgen).

Guides' Program: Tropical Plants of the Conservatory (Mrs. Hayward); Guiding is Fun (The Associates). Volunteer guides conducted tours for over 9,000 visitors in 1974.

Children's Program: Transplanting Techniques for Young Gardeners (Mr. Hannigan); Vegetable Gardening for Young People (Mr. Hannigan); Christmas Decorations (Mr. Hannigan); Projects for Young Naturalists (Mrs. Vila).

In addition to the educational classes listed above, a number of field trips within Denver and nearby areas were conducted and attended by many members. These included the Plant Identification Field Trips conducted by Dr. Brunquist twice monthly from March through September, a trip to Loveland Pass conducted by Mrs. Shepherd, and a trip to Mt. Goliath led by Mrs. Ash. Also, several tree walks in the Denver and Boulder areas were conducted by Dr. Feucht, Dr. Gambill, and Mr. Robertson.

In the lecture series, Dr. Henry M. Cathey spoke on "Green is the Color of Hope", and the Denver Botanic Gardens together with the Colorado Mycological Society jointly sponsored a lecture by Dr. Alexander Smith and one by Dr. Orson K. Miller.

A free, monthly film series was begun in November, 1974, and two films, "My Garden, Japan" and "This Garden, England", were shown to approximately 70 people.



Publications

The quarterly *Green Thumb* magazine of the Botanic Gardens, presented a variety of articles dealing with horticulture, flora, and ecology of the area. The 1974 spring issue, devoted to the growing of vegetables in the Rocky Mountain area, was a particularly helpful issue for the amateur vegetable gardener. Wes Woodward, editor of the magazine since 1972, retired in March. During his two years as editor, the publication greatly benefited from his journalistic training and years of experience. Dr. C. Eugene Osborne served as editor for the autumn and winter issues and Dr. Janet L. Wingate and Dr. F. H. Wingate assumed the editorship in December.

Margaret Sikes, editor of the monthly *Green Thumb Newsletter*, continued to report the continuing activities at the Gardens. Eileen Bloustein, serving as editor and assisted by Beverly Nilsen, prepared the bimonthly publication, the *Jolly Green Gardener*, for the junior membership of the Botanic Gardens.

The annual report, edited by Wes Woodward, was published under the title "People Make It Possible."

Helen Fowler Library

During 1974, there were 650 books added to the Library collection bringing the total volumes in the collection to 5,510. Of the new books, 130 were purchased by the monthly donation by the Associates of Denver Botanic Gardens, 145 were purchased with funds earned at the book sale, 41 books donated for the book sale were integrated into the Library collection, and 32 were bought with money collected from fines. The largest number of books was acquired through gifts from individuals, clubs, organizations, and memorials. These accounted for 302 acquisitions, so that almost half the Library accessions during 1974 came as a result of gifts rather than funds allocated for the purchase of books. During 1974, circulation of books increased by 27% over 1973 and 292 books were rebound using the Tremont Foundation fund set aside for this purpose. The number of periodical subscriptions was increased to 52 in 1974 at a cost of \$757.49. In addition, 75 periodicals were received through exchange, and 35 were received as gifts.

In order to participate more fully in the interlibrary loan system, a copy of the Helen Fowler Library shelf list was made available to the Bibliographic Center. This project entailed many hours of work by the Library volunteers. After more than one year, the project has been completed. We will continue sharing our accession list by sending duplicate cards to the Bibliographic Center on a monthly basis.

The cataloging of the books for the Waring Rare Book Room has now been completed. The collection consists of 388 titles. Those books published before 1872 have been checked against the 2nd edition of *Thesaurus Literaturae Botanicae* by Georg A. Pritzel, which is a general botanical bibliography of books independently published in all languages prior to 1871. According to bibliographer Jens C. Bay, the Pritzel bibliography is "without comparison the most comprehensive and accurate work in its field". We have 60 works listed in the Pritzel bibliography.



Helen Fowler Library

Restoration and repair of books by Edith Thornton was begun. The Funds are being provided by Mrs. Waring. Although the rare books necessitate restricted use, the collection has attracted many students, artists, and botanists from several states, as well as from England and New Zealand.

Members of the Greenhouse and Library staffs initiated a new program termed the "House Plant Clinic". Twice weekly, staff members answered telephone inquiries regarding problems with plants, or inspected plants brought to the Gardens and offered advice. This proved to be a popular program and will be continued in 1975.



Main Entrance to Boettcher Memorial Complex

Use of Facilities

The continually increasing interest in the Denver Botanic Gardens is reflected in the turnstile count for 1974 of 230,255 visitors, the largest number yet recorded for one year. Meetings, lectures, programs, and shows in Horticulture Hall were attended by 13,185 persons. Several hundreds attended such events as the Rose Symposium, Gladiolus and Dahlia Bulb Auction, State Design Assembly, and the National Parks and Recreation Association annual dinner. Visitors numbered in the thousands at each of the following: Annual Plant Sale, Gift Shop Christmas Sale, opening of the new greenhouses, Colorado Flower Growers' carnation display, African Violet Show and Sale, Iris Show, Denver Orchid Society Show, and the Colorado Watercolor Exhibit.

Attendance at classes and meetings in the lecture rooms of the Education Building reached 9,728, while 5,260 persons attended meetings in the Botanic Gardens House.

Each hour that the Conservatory and Library are open to the public is filled with a constant stream of visitors.

Children's Garden

The Children's Garden program was in its 15th year in 1974. The program ran from April through September and served 125 children (63 beginners and 62 advanced) between the ages of 9 and 14. Indoor instructional classes in preparing, planting, and maintaining a vegetable garden were held in April. Outdoor gardening work began in early May with each child tending his own 10 ft. by 10 ft. plot. Three educational lectures were presented to the children during the summer: Weeds, Eugene Heikes (Extension Professor, C.S.U.); Attracting Birds to Your Garden, Patti Echelmeyer; Preparing Gardens for Exhibits, Dorothy Claiborne.

Other events in the program included three pot-luck events in which vegetables from the Children's Garden were prepared and enjoyed. A garden fair was held in which the children exhibited their best vegetables and flowers for judges and the public, with several awards being presented in the form of ribbons. The program culminated in September with a graduation ceremony at which certificates were awarded to children successfully completing the program. In addition, trophies were awarded to 22 children with the best gardens. Instructor for the Children's Garden Program was Mrs. John Vittetoe who was assisted by 35 supervisors.





Balcony Display

Kathryn Kalmbach Herbarium

Work has continued on the identification and mounting of specimens with their incorporation into the herbarium collection, now numbering over 10,000 sheets. Dr. E. H. Brunquist donated a large number of unmounted specimens for the general collection plus many mounted specimens for educational purposes. Dr. Zeiner has graciously added her grass collection of over 400 specimens to the Herbarium collection.

Throughout the year, interesting collections were displayed in the glass cases on the balcony outside the Herbarium. These displays included lichens, allergenic plants, old plant collections of the Rocky Mountain region, and seasonal displays. During the growing season, live material was displayed. This constantly changing display was very helpful to visitors seeking the identification of wild plants. In addition, Dr. Zeiner and the Herbarium Committee assisted members and visitors with plant identifications and also answered questions concerning the local flora.

Mycological Research Laboratory

The Mycological Research Laboratory, under the direction of Dr. D. H. Mitchel, is continuing its vigorous activities in the areas of research, education, and community service. The mycological herbarium continues to grow and now contains nearly 6,000 specimens which have been studied, identified, indexed, and described both macroscopically and microscopically. Study of Colorado slime molds (Myxomycetes) continues, with the collection of 300 specimens in 1974. Also, over 1,000 specimens of gill fungi were collected, on which 2 active projects are progressing, involving *Melanoleuca* and *Armillaria*.

Many of the research projects have been published in the form of journal articles and books. Work on the genus *Disciseda* will be published in the June issue of *Mycologia*, and two other studies are presently in press, awaiting publication. Also in press is a book on mushroom poisoning co-authored by Dr. Mitchel. A microfiche edition of poisonous mushrooms has been prepared and distributed to poison centers throughout the nation.

An active exchange program continues with various institutions, including the National Poison Center in Beltsville, Maryland. Assistance in identifying suspected poisonous mushrooms has been furnished to Poisonlab, Inc. and others.

Courses and lectures in mushroom identification and basic mycology were offered again this past year. The Laboratory was visited in 1974 by two renowned mycologists, Dr. Alexander Smith and Dr. Orson K. Miller.





MEMORIAL GIFTS

Memorial contributions have been received during 1974 for the following persons whose names have been inscribed in the Denver Botanic Gardens *Book of Memories*.

MR. JAMES K. BAILEY

MRS. FREDERICK C. BEUTLER

DR. IRA BROWNLIE

MRS. ROSAMOND U. CARPENTER

MR. S. R. DeBOER

MRS. ETHLYN E. ESSIG

MRS. JOHN EVANS

MR. MILTON FREIS

MR. GEORGE FUKUMA

MR. L. W. GOUDY

MARYSHIRLEY JACOBS

MRS. CLARKE KEELY

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MRS. DANIEL A. MILLETT

MRS. RICHARD E. PATE

MR. & MRS. JAMES RINGOLD

MR. RAYMOND E. SARGEANT, JR.

MR. EUGENE SCHIERBURG

MR. HERBERT E. SCHWAN

MRS. H. D. STAYTON

MR. ETHELBERT WARD, JR.

MARILLYN M. WILLIAMSON

CRAIG WYATT



Garrison Frieze, Plains Garden



Greenhouses

DENVER BOTANIC GARDENS, INC.

909 York Street

Denver, Colorado

FINANCIAL STATEMENT

December 31, 1974

ASSETS

Cash Accounts:

Checking Account	\$ 5,790
Savings Accounts	129,004
Investment Trust Account	101,630
Commercial Paper	100,000
Tax Reserve, etc.	<u>1,840</u>

\$ 338,264

Other Assets:

Real Estate	204,000
Conservatory	882,894
Education Building	861,454
Master Plan Development	694,865
Greenhouses	155,805
Land — 11th & York	140,778
Equipment Owned	<u>8,017</u>

2,947,813

TOTAL

\$ 3,286,077

EQUITY ACCOUNT

Liabilities:

Notes Payable	46,139
Rent Deposits	<u>600</u>

\$ 46,739

Fund Accounts:

Represented by Cash	338,264
Represented by Other Assets	<u>2,901,074</u>

3,239,338

TOTAL

\$ 3,286,077

ACCOUNTANT'S OPINION

We have examined the balance sheet of the Denver Botanic Gardens, Inc. as of December 31, 1974. Our examination was made in accordance with generally accepted auditing standards and accordingly included some other auditing procedures as we considered necessary in the circumstances.

In my opinion, the accompanying balance sheet presents fairly the financial position of the Denver Botanic Gardens, Inc. at December 31, 1974.

J. D. Vander Ploeg
Certified Public Accountant



The Gift Shop

----- CUT HERE -----

DENVER BOTANIC GARDENS
909 York Street, Denver, Colorado 80206

I hereby apply for membership in the Denver Botanic Gardens.

Enclosed is \$ _____ for my annual dues.

Class of membership desired (Check one)

- | | | | |
|---|---------|--|-----------|
| <input type="checkbox"/> Junior (Age 15 and under) | \$ 3.00 | <input type="checkbox"/> Supporting | \$ 100.00 |
| <input type="checkbox"/> Student (High School, College) | 5.00 | <input type="checkbox"/> Corporation | 200.00 |
| <input type="checkbox"/> Regular | 10.00 | <input type="checkbox"/> Patron | 500.00 |
| <input type="checkbox"/> Participating | 30.00 | <input type="checkbox"/> Life (Single contribution) | 1,000.00 |
| <input type="checkbox"/> Contributing | 50.00 | | |

*NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

NEW MEMBER ☐

RENEWAL ☐

***PLEASE INDICATE EXACTLY HOW NAME (OR NAMES) SHOULD
 READ FOR MEMBERSHIP RECORDS.**

THE VOLUNTEERS

Their organizations and committees

ASSOCIATES OF DENVER BOTANIC GARDENS

Mrs. Theodore B. Washburne	<i>President</i>
Mrs. H. S. Glick	<i>Conservatory Guides Scheduling Chairman, 1973-1974</i>
Mrs. L. A. Waterman, Jr.	<i>Conservatory Guides Scheduling Chairman, 1974-1975</i>
Mrs. Mary Secrest	<i>Gift Shop Committee Chairman</i>
*Miss Mary Jacobson	<i>Hostess and Information Chairman</i>
Mrs. William B. Collister	<i>Training Program Chairman, 1974-1975</i>

The Associates of Denver Botanic Gardens should be justifiably proud of their record of achievements and accomplishments this past year. With 200 members they gave 17,946 hours of volunteer time in many areas of the Garden's operations.

Everyday their smiles, knowledge, and hospitality are helping the Gardens grow. Seven days a week, 6 hours per day, the Gift Shop is open, with its superb and unique handcrafted items and tasteful gifts. In the Library, the volunteers help others find the information and books they seek. In the front lobby our Hospitality Desk is answering questions and dispensing information to interested visitors, and throughout the day the Guides are leading groups through the Conservatory. The Guide program has been strengthened by the new position of Scheduling Chairman and an influx of new participants taking the Guide training classes. All together, 10,771 people were guided through the Conservatory this past year (a decrease, due to the energy crisis and ensuing reduction of school tours). The Guide program has also expanded its outlook with visual aids, such as shadow boxes and a slide program, to further its goal of increasing a visitor's enjoyment of the Conservatory plants.

The Associates tangible contributions included final payment towards one of the new Greenhouses, the construction of a gazebo in the northwest section of the Gardens, an orchid display case in the Conservatory lobby, and most recently, a contribution to start development in the southeast corner of the Gardens with an ongoing pledge to contribute to that project, which should be a challenging goal for this coming year.

*Mrs. Theodore B. Washburne
President*

**Deceased*

AROUND THE SEASONS CLUB

Mrs. H. S. Glick *President, 1973-1974*
Mrs. Doris Evans *President, 1974-1975*

The Club carried on a full series of monthly programs for its members including such diverse topics as "seed and equipment catalogs," "use of native plants in landscaping," a lesson on plant families, and even "herbs of Greece." The latter was the program in June which was celebrated as a special birthday party for one of the charter members, Mrs. Katherine Crisp, who turned 90 years old. A special fund was set up in her honor to be used for planting trees in one section of the outdoor gardens.

During the summer some of the members concentrated efforts to collect data on the blooming succession at the Garden's newly acquired Reed property above Evergreen. Herbarium specimens were collected and are being mounted during the winter months. It is expected that the study will continue for several seasons.

September saw the installation of new officers who capably took charge of the activities of the Club. The largest project, the fall sale of dried plant material, was again a great success. Thanks are due the members and friends for their continuing efforts in growing, collecting, drying and sometimes preserving the various flowers, weeds, nuts, cones, and pods. Members were also active in the crafts group which produced Christmas wreathes and decorations, and also the unusual favors which graced the tables of the DBG annual dinner. The year 1974 ended with a delightful program of slides detailing a recent trip to the South Pacific, followed by the traditional holiday luncheon.

Mrs. H. S. Glick
President, 1973-1974

DENVER BOTANIC GARDENS GUILD

Mrs. Field C. Benton *President, 1973-1974*
Mrs. C. J. Nicoulin *President, 1974-1975*
Mrs. Robert L. Davis *Terrace & Garden Tour Chairman*

The year 1974 was an extremely active and successful one for the Denver Botanic Gardens Guild. The brick-laying of the Herb Garden extension was completed and a drinking fountain and sundial, a memorial to Mrs. Persis M. Owen were installed.

The Terrace and Garden Tour was held in July with the proceeds going towards the brick-laying of the Herb Garden extension.

Guild members picked and prepared herbs for vinegar in August. October and November were devoted to Herb Garden clean up and bottling of 1,241 bottles of vinegar.

Mrs. Carl J. Nicoulin
President, 1974-1975

GARDEN CLUB OF DENVER

Mrs. J. Kenneth Malo *President, 1973-1974*
Mrs. Richard A. Kirk *President, 1974-1975*

COMMITTEES

Annual Dinner

Co-Chairmen

Mrs. John Brooks, Jr. Mrs. Richard A. Kirk

Chatfield

Mr. Edward P. Connors Chairman
Dr. Moras L. Shubert Mr. Con Tolman
Miss Exie White

Children’s Garden

Mrs. James Layden Chairman
Mrs. Donald W. Denton Dr. A. C. Hildreth
Dr. John R. Durrance Mrs. John Vittetoe
Mrs. Giles Filley Mrs. James J. Waring

Development and Public Relations

Mr. Alexander L. Kirkpatrick Chairman
Mrs. Walter B. Ash Mrs. Norman F. Patrick
Mrs. John Brooks, Jr. Mrs. J. V. Petersen
Mr. George M. Canon Mrs. Howard Rea
Mrs. Richard A. Kirk Miss Enid Slack
Mrs. William Stanley

Editorial

Mrs. J. V. Petersen Chairman
Mrs. Julia Andrews-Jones Mrs. Robert M. Kosanke
Mrs. Walter B. Ash *Mrs. Frances White Novitt
Mrs. Paul A. Bloustein Dr. C. Eugene Osborne
Mrs. William H. Crisp Dr. Moras L. Shubert
Mrs. George H. Garrey Mrs. J. P. Steele, Jr.
Mrs. Phil Hayward Dr. F. H. Wingate
Dr. A. C. Hildreth Dr. Janet L. Wingate
Dr. Helen Marsh Zeiner

Finance

Mr. Richard A. Kirk Chairman
Mr. O. Ben Haley, Jr. Mr. Lawrence A. Long
Mr. Alexander L. Kirkpatrick Mr. John C. Mitchell

*Deceased

Herbarium

Dr. Helen Marsh Zeiner	Chairman
Mrs. Walter B. Ash	Mrs. Marjorie Shepherd
Dr. E. H. Brunquist	Dr. Janet L. Wingate
Mrs. Calvin Fisher	Mrs. Leslie P. Witte
Mrs. F. Richard Yeatts	

House

Mrs. E. H. Honnen	Chairman
Mrs. George M. Canon	Mrs. Harley G. Higbie, Jr.
Mrs. George H. Garrey	Mrs. Richard A. Kirk
Mrs. James J. Waring	

Library

Miss Rachael Hauck	Chairman
Miss Lucy M. Crissey	Mrs. Bruce Jackson
Miss Geneva Eldridge	Mrs. L. E. Johnson
Mrs. John F. Falkenberg	Ms. Peg Milroy
Dr. A. C. Hildreth	Mr. Henry J. Shearouse
Mrs. James L. White	

Lobby Court

Mrs. Donald C. Campbell	Chairman
Mrs. Frank B. Freyer, II	Mr. O. Ben Haley, Jr.

Planning

Mr. Harley G. Higbie, Jr.	Chairman
Mr. Edward P. Connors	Mr. John C. Mitchell
Dr. John R. Durrance	Mr. James C. Owen
Mrs. James J. Waring	

Plant Sale

Mrs. John F. Falkenberg	General Chairman
Mr. Chris McCall	Co-Chairman

*Bridge over
the "stream"
flowing from
Japanese
Garden*



Membership Roster

DENVER BOTANIC GARDENS

(As of Dec. 31, 1974)

Abbot, Mrs. C. B.
Abegg, Chenia A., Jr.
Abrahams, Mr. & Mrs. Richard
Abramovitz, Mrs. Frances K.
Absalom, Anna
Accola, Mrs. Olga G.
Ackerman, Leona N.
Ackerman, Mrs. Theron L.
Adams, Mrs. J. Loren
Adams, Miss Marjorie
Adkins, Nancy D.
Adolph, Peter J.
Ahrens, Thomas P.
Aikawa, Mrs. J. K.
Aitken, Mrs. L. L.
Alberg, Mrs. G. W.
Alberico, P. A.
Aldrich, Mrs. Robert A.
Aldridge, Mrs. Richard D.
Alexander, Mr. & Mrs. Bruce
Alexander, Mr. & Mrs. P.K., Jr.
Allen, Douglas
Allen, Mrs. James W.
Allen, Mrs. John T., Jr.
Allen, Mrs. Peggy
Allen, R. S.
Almquist, Mrs. C. A.
Alpert, Mrs. Sheri
Alquist, David C.
Alt, Robert L.
Altwater, Mrs. F. V.
Ambler, Mrs. John
Ambrose, Arlen S.
Amundsen, Mary
Andersen, Carol
Anderson, Mrs. Andrew, III
Anderson, Mr. & Mrs. C. H.
Anderson, Mrs. Dennis
Anderson, Mr. & Mrs. Keith

Anderson, Marilyn B.
Anderson, Mrs. Paul
Anderson, Ruth S.
Anderson, Sally
Anderson, Mrs. Truman E.
Andrews, Mrs. Edith A.
Andrews, Mr. & Mrs. E. William
Andrews, Mrs. M. Richard
Ansicks, Mrs. R.
Applewood Seed Co.
April, Mrs. Elizabeth M.
Archer, Mrs. Philip G.
Archer, Roy
Arndt, Dr. Karl
Arneill, Dr. & Mrs. James R., Jr.
Arnold, Mrs. C. O.
Arnold, Mr. & Mrs. Timothy R.
Around the Seasons Club
Arps, Louisa Ward
Arthur, James H.
Ash, Mr. & Mrs. Walter B.
Ashton, John Carven
Ashworth, Mrs. Margaret I.
Aspinwall, Mr. & Mrs. William V.
Atchison, Mrs. A. P.
Athey, Mrs. C. R., Jr.
Atwell, Mr. & Mrs. Scott
Austin, Miss Billie C.
Austin, Mrs. J. E.
Avery, Mrs. Richard
Axley, Mr. & Mrs. Hartman

Babcock, Mrs. Bradford N.
Bachman, Betty
Bagley, Miss Alice
Bailey, Mr. & Mrs. Curtis
Bailey, Mrs. Richard H.
Baily, Mr. & Mrs. Jesse S.
Bain, Mrs. Donald K.

Bain, Mrs. Francis M.
Bainard, Mr. & Mrs. George
Baird, Mrs. R. N.
Baker, Charles A.
Baker, Dr. Charles M.
Baker, Clovis G.
Baker, Mrs. Janet A.
Baker, Martha M.
Baldner, Lindsay
Ballentine, Elizabeth M.
Ballin, Mrs. Ethel M.
Ballweg, Margaret
Bane, Mrs. William N.
Bankhead, W. R.
Banks, Esther L.
Barbe, Mrs. Hubert L.
Barcheuger, Mr. & Mrs. W. George
Bardwell, Lisa
Bargen, Mrs. Nancy
Barker, R. A.
Barkley, Mrs. R. A.
Barnard, Dr. H. I.
Barnard, Rollin D.
Barnacle, Marilynne
Barnes, Ms. Cara Chell
Barnes, Mr. & Mrs. John S.
Barnett, Mr. & Mrs. Douglas E.
Barnett, Maurine
Barnhart, Mrs. Woodson
Barnwell, M. Jones
*Barone, Charles P.
Barrett, Winnie
Barrett's Greenhouse
Barron, Mrs. Arch
Barry, Gail & Chips
Barsis, Albrecht P.
Barsotti, David
Bartel, Phyllis
Bartels, Mr. & Mrs. John

Bartlett, Harold W. & Mary Jo
 Barton, Dr. & Mrs. M. D.
 Bast, Suzan
 Bates, Sybil D.
 Baude, Mrs. Hugh K.
 Bauer, Jennifer D.
 Bauer, Max
 Bauer, Mr. & Mrs. Timothy K.
 Bauman, Mr. & Mrs. Earl W.
 Bayer, Chet W.
 Beal, Cathy
 Beal, Mr. & Mrs. Danforth
 Beam, Mrs. Orville
 Beardsley, Mrs. H. H.
 Beasley, Mrs. Susan J.
 Beatty, Mr. & Mrs. Stephen W.
 BeBee, Nevin
 Bechtold, Mrs. Charlotte A.
 Bechtold, Mrs. Lemoine J.
 Becker, Mrs. H. C.
 Becker, Ralph J.
 Becker, Ralph W.
 Becker, Mrs. R. C.
 Beckman, Mr. & Mrs. Fred
 Bedore, Leona G.
 Bee, Maeve M.
 Beeler, Mrs. Miriam H.
 Beery, Clifford M.
 Behrent, Mrs. Robert V.
 Beidleman, Dr. Richard G.
 Bekins, Mrs. Barry
 Bell, Mrs. Frederick F.
 Bell, Mr. & Mrs. Rick
 Bemis, Anita
 Benedetti, Mr. & Mrs. Walter
 Benedict, Mr. & Mrs. Norman G.
 Benjamin, Hertha F.
 Bennet, Mr. & Mrs. Harold H.
 Bennett, Evelyn Jo
 Bennett, Mr. & Mrs. Mark F.
 Bennett, Mrs. Melba R.
 Benson, Dennis
 Benton, Mr. & Mrs. A. E.
 Benton, Mrs. Field C.
 Berend, Arlene M.
 Berg, Mrs. R. Peter
 Berger, Debra
 Berggren, James L., Jr.
 Bergin, Col. & Mrs. James J.
 Bergkamp, Mr. & Mrs. Harold E.
 Berk, Mrs. Leonard
 Berman, Harry
 Bermingham, John R.
 Bernstein, Carol
 Bernstein, Dr. & Mrs. William
 Berry, Mrs. Bettie
 Bertolotti, Suzanne
 Best, Mrs. Imogene Spencer
 Betcone, Barbara
 Bevington, Mr. & Mrs. John T.
 Bibee, Ernest A.
 Bickell, Mrs. William H.
 Bigelow, Mrs. Eugene V.
 Bigelow, Mr. & Mrs. Roy
 Billot, Joseph & Carole
 Birkenmayer, Mrs. A. B.
 Bisenius, Jane M.
 Bishop, Mr. & Mrs. K. M.
 Bishop, Marcia
 Bittner, B. J.
 Bivans, Miss Margaret
 Black, Mr. & Mrs. Andrews D.

Black, Mr. & Mrs. Robert C., III
 Black, James S.
 Black, Mrs. Lavinia E.
 Black, Dr. & Mrs. William C.
 Blake, Diane Jane
 Blanchet, Dr. & Mrs. D.
 Blanchette, Richard
 Bland, Robina
 Blandford, Dr. & Mrs. S. E.
 Blaney, Dr. L. F.
 Blankenship, Ken
 Bloom, Joy
 Bloustein, Dr. & Mrs. Paul A.
 Blunt, Mrs. June C.
 Bobal, Anne T.
 Bock, Mr. & Mrs. Paul K.
 Bode, Miss Gladys L.
 Boettner, Mrs. J. L.
 Boggess, Mrs. Scott
 Boggs, Howard L. Family
 Bolich, Dr. Donald L.
 Boline, Mrs. E. A.
 Bolle, Edward E.
 Boller, Geraldine
 Bolton, Mrs. Harry B.
 Bonnie, Mrs. A. G.
 Booth, Charles H.
 Borgen, Mrs. Bjorn K.
 Borland, James N.
 Bossert, Meredith Ann
 Bostrom, Mrs. Roy O.
 Boswell, Kenneth L.
 Bosworth, Otis B.
 Bosworth, Richard H.
 Bosworth, Mrs. Robert G.
 Bosworth, Mrs. Robert G., Jr.
 Bottorff, Richard L.
 Bouck, Miss Polly
 Boulder Garden Club
 Bowers, Mr. & Mrs. Charles L., Jr.
 Bowers, Miss Eva F.
 Bowes, Donald E.
 Bowman, Betty O.
 Boyd, Mr. & Mrs. C. K.
 Boyd, Mrs. Gary D.
 Boyer, Mrs. Barbara S.
 Boyle, Dr. & Mrs. Richard E.
 Brace, Mr. & Mrs. Robert
 Braden, Mrs. John W.
 Bradford, Mrs. William E.
 Bradley, Carroll
 Bradley, Mr. & Mrs. Vester C., Jr.
 Bradshaw, Wanda
 Braford, Lois L.
 Bramley, Mrs. Howard
 Brennan, M. G.
 Brewer, Ericka
 Brewster, Mrs. Rodman P.
 Bridges, William G.
 Briesemeister, Ethel
 Briggs, Robert A., Jr.
 Brighton, Anne E.
 Brightwell, Mrs. Thomas P.
 Brink, Dr. Kenneth M.
 Brink, Sandra Anne
 Brock, Dorothy
 Brock, Mrs. Loring
 Brock, Mrs. Sidney L., Jr.
 Brock, Mrs. Wadsworth
 Brodie, Mrs. Joan
 Brogan, Louise J.
 Bromagin, Mrs. E. A.
 Bromfield, Alfred J.

Bromfield, Mrs. Helen P.
 Bromfield, Mrs. Lawrence
 Bromfield, Mrs. M. C.
 Bronk, Ralph S.
 Brookover, Mary Ellen
 Brooks, Mrs. John, Jr.
 Broughton, Mrs. Joseph
 Brower, Virginia R.
 Brown, Mrs. Alden H.
 Brown, C. A.
 Brown, Mrs. Catherine G.
 Brown, Mrs. Donald F.
 Brown, Mrs. F. O.
 Brown, Mrs. Gilbert
 Brown, John S., III
 Brown, Mrs. Keith L.
 Brown, Lynne E.
 Brown, Mrs. Mackintosh
 Brown, Mr. & Mrs. Richard P.
 The Ruth H. Brown Foundation
 Brown, Virginia H.
 Brown, Dr. William R.
 Brownson, Jacques C.
 Bruhn, Mr. & Mrs. Herbert A.
 Brunkhorst, H. J.
 *Brunquist, Dr. E. H.
 Brunner, Albin & Ann
 Brunson, Thayer
 Bryans, Mr. & Mrs. David M.
 Bryant, Bruce
 Bryant, Ms. Mary
 Buch, Mrs. Walter E.
 Bucher, Mrs. Lawrence H.
 Buck, Mr. & Mrs. Arnold F.
 Buckels, Marvin W.
 Buckley, Mrs. Draxy B.
 Bucknam, Robert C.
 Buie, Inez J.
 Bunch, Mr. & Mrs. James T.
 Burchett, Mrs. Audrey M.
 Burdick, Mr. & Mrs. Duncan
 Burdick, Lynn
 Burgess, Mrs. Ralph
 Burgmann, Robert & Denise
 Burket, Mrs. J. Warren, Sr.
 Burkhard, Elmer L.
 Burnett, Emery
 Burnkrant, Richard A.
 Burns, Mr. & Mrs. Hugh
 Burson, Dr. & Mrs. Curtis E.
 Burt, Mrs. Harvey A.
 Buschauer, Mr. & Mrs. Charles L.
 Buschman, R. G.
 Bushnell, Dr. W. J.
 Butler, Mr. & Mrs. David
 Butler, Mrs. David
 Butler, Dianna E.
 Butts, Mrs. John

 Cain, Lynn C. Mrs.
 Calkins, Mrs. Bradley H.
 Callender, Dr. & Mrs. James M.
 Callender, Dr. & Mrs. R. Sam
 Calloway, Mrs. Roy E.
 Calvert, Mrs. F. W.
 Camp, Richard A.
 Campbell, Mr. & Mrs. Alex B.
 Campbell, Mrs. Donald C.
 Campbell, Mrs. Richard
 Campbell, Dr. William A.
 Candlin, Dr. & Mrs. Francis T.
 Cann, Mrs. John R.

Cannon, Mrs. Brown W.
 Cannon, Mrs. George R.
 Canon, Mr. & Mrs. George M.
 Caperton, Mr. & Mrs. Harry O.
 Capron, Diane
 Carey, Anne B.
 Carleton, James
 Carlson, Mrs. Delbert L.
 Carlson, Jim
 Carlson, Kenneth E.
 Carlson, Sue
 Carmeny, Miss Lily V.
 Carney, Mrs. J. G.
 Carpenter, Dr. David
 Carpenter, Farrington
 Carpenter, Joseph F.
 Carpenter, Mrs. Thomas N.
 Carpenter, Mrs. Virginia K.
 Carr, Mr. & Mrs. Thomas L.
 Carroll, Mrs. J. V.
 Carson, Mr. & Mrs. J. Nevin
 Carswell, Frances G.
 Carter, Pegie A.
 Carter, William J.
 Caruthers, Dr. & Mrs. Samuel B.
 Cary, Mrs. Ward E.
 Case, Christine
 Case, George Thomas
 Casey, Mr. & Mrs. George S.
 Cassidy, Arthur & Barbara F.
 Castillo, C. Edward
 Castle, Miss Mary
 Cater, Mr. & Mrs. Fred W.
 Cathey, Dr. Henry M.
 Caulkins, Mr. & Mrs. George P., Jr.
 Cavelli, Nora
 Cazer, Mrs. James L.
 Cedars, Chester M.
 Chambers, Kaye
 Chandler, Dr. Earl
 Chapman, Mrs. Thomas
 Chappell, Mrs. Pierre
 Chaput, Arthur F.
 Charsky, Mrs. Louis
 Chatfield, Miss Mary Louise
 The Walter S. Cheesman Realty Co.
 Cheever, Mrs. K. E.
 Cheever, Mr. & Mrs. Richard W.
 Cherington, Dr. & Mrs. Michael
 Cherne, Mrs. Howard R.
 Cherry Hills Heights Garden Club
 Cherry Point Garden Club
 Chester, Mrs. Miriam
 Chilcote, Katherine V.
 Child, Dean H.
 Childs, Mrs. S. B., Jr.
 Chiricos, Mr. & Mrs. William
 Choitz, Mrs. Marcel P.
 Christensen, Mrs. C. J.
 Christenson, Mrs. D. L.
 Christy, Mr. & Mrs. Gary
 Ciancio, Joe, Jr.
 Clagett, Mrs. Ellen
 Claiborne, Ralph
 Clark, Mrs. M. Donald
 Clark, Dudley Holbrook
 Clark, Harlan B.
 Clark, L. Donovan
 Clark, Sally S.
 Clas, Kathleen E.
 Clawson, Elizabeth
 Clayton, Mrs. Glenn, Sr.

Clayton, Mrs. Mack L.
 Clements, Ellis C.
 Clements, Ruby M.
 Click, Mrs. L. D.
 Clifford, Mrs. John H.
 Clifford, Mr. & Mrs. William
 Clifton, Mr. & Mrs. Randall M.
 Cline, Mr. Everett L.
 Clinger, Dennis
 Clinton, Robert
 Ciose, David
 Close, Mr. & Mrs. Edward B.
 Clough, Sandra J.
 Cloughley, Jan
 Clousing, T. S.
 Clupf, Mrs. Harlan E.
 Cody, Mrs. Edward L.
 Coe, John Clark
 Cohen, Mrs. Harvey
 Cohen, Mrs. M. C.
 Cohen, Mrs. Robert
 Cohen, Mrs. Sam E.
 Cohn, Mrs. Samuel C.
 Cole, Mrs. Harrison W.
 Cole, Mrs. J. W.
 Cole, Mrs. Thomas H.
 Collier, T. R.
 Collins, Annie Ree
 Collins, Mr. & Mrs. Dabney Otis
 Collins, Lynda B.
 *Collister, Mr. & Mrs. William B.
 Colorado Cactophiles
 Colorado Federation of
 Garden Clubs, Inc.
 Colorado Gladiolus Society
 Colorado Mountain Club
 Colson, Miriam
 Columbine Garden Club of
 Buena Vista
 Community College of Denver
 Community Services CCD-Auraria
 Comstock, Mr. & Mrs. Steven H.
 Cone, Lt. Col. & Mrs. Leo F.
 Congdon, Edwin A.
 Congdon, Mr. & Mrs. Thomas E.
 Connor, Mr. & Mrs. Jon J.
 Connors, Edward P.
 Conover, Mrs. Frederic K., II
 Conover, Irving A.
 Cook, Fred L.
 Cook, Mrs. J. R.
 Cook, Lois Lorton
 Cook, Mrs. Mildred
 Cook, Sally
 Cook, Mr. & Mrs. William L.
 Coombe, Susan G.
 Cooper, Mr. & Mrs. Benjamin E.
 Cooper, Lynn
 Cooper, Mrs. Richard H.
 Cooper, Sandee
 Coors, Mrs. Adolph, III
 Coors, Mrs. Geraldine J.
 Cosgriff, Mrs. T. A.
 Costa, Mrs. John E.
 Cote, Michele Patrice
 Cowan, Dr. Robert Brice, Jr.
 Cowgill, Steven C.
 Cowles, Virginia
 Cox, Ethel Irene
 Cox, James C.
 Cox, Joy W.
 Cox, Mrs. Philip G.

Coyle, Mrs. Sam D.
 Craddock, Jean
 Crain, Mrs. Richard P.
 Cramer, Mrs. Harold F.
 Craven, Elizabeth L.
 Crawford, Miss Caroline
 Creighton, Mrs. Thomas E.
 Cresci, Marietta L.
 Crestmoor Mile High Gardeners
 *Crisp, Mrs. Katharine B.
 Crissey, Miss Lucy M.
 Croak, Mary Kay
 Crocker, Connie
 Cross, Gwendolyn E.
 Crousen, Clayne C.
 Crow, Alan
 Culhane, Mr. & Mrs. James E.
 Cullen, Mrs. Gerald B.
 Culver, Mrs. Donald M.
 Cunningham, Dr. & Mrs. T. D.
 Curatolo, Audrey
 Curry, Mrs. Eleanor M.
 Curry, Mary Drew
 Curtiss, Mrs. Eva Mae
 Cusack, Kate
 Cusic, Marian K.
 Cutting, Sandra S.

Dahlberg, Mrs. William W.
 Daily, Mr. & Mrs. Duane W.
 Dalton, Mr. & Mrs. Bruce
 Daly, Mr. & Mrs. Clarence J.
 Daniel, Lawrence E. & Lillian V.
 Daniels, Janet
 Daniel, Miss Stormy A.
 Daraghy, Albert
 Daraghy, Judy
 Darby, Mr. & Mrs. Keith
 Darby, Mr. & Mrs. Paul T.
 Davidson, Leila Webb
 Davidson, Mrs. Mark S.
 Davidson, Mrs. Paul T.
 Davis, Mrs. Allen H.
 Davis, Betty J.
 Davis, Clarice
 Davis, Dean Allen
 Davis, Mrs. C. Earl
 Davis, Mr. & Mrs. J. S.
 Davis, Mrs. John C., III
 Davis, Mel W.
 Davis, Nelson H.
 Davis, Phillip K.
 Davis, Mr. & Mrs. Richard M.
 Davis, Mrs. Robert L.
 Davis, Tessa & Alan
 Davis, Dr. & Mrs. W. Grayburn
 Davis, Mrs. William
 Davison, Frances M.
 Davison, Mr. & Mrs. Robt. P.
 Dawson, Edgar E.
 Dawson, Mrs. J. C.
 Deason, Mrs. Joe D.
 Decker, Mr. & Mrs. Martin G.
 Decker, Peggy
 Decker, Mrs. Ross E.
 DeCou, Martha
 Deering, Fred A.
 Delaney, Mrs. James
 DeLong, Sara S.
 DeMaree, Mrs. Betty
 Deming, Miss Joyce
 Denham, Mrs. Dale L.

Dennett, Joann T.
 Dent, Margaret
 Denny, Richard
 Denver Forestry & Landscape Co.
 *Denver Wholesale Florists
 DeTuerk, Mrs. Paul R.
 DeWolfe, Dave
 DeWoody, Jean
 Diamond, Mrs. C. J.
 DiCarlo, Robert H.
 Dicker, Mr. & Mrs. A. James
 Dieter, Mr. & Mrs. Walter W.
 Dieterich, Kathryn
 Dietler, Cortlandt S.
 Dig and Dream Garden Club
 Diggs, Mrs. Marshall R., Jr.
 Dilatush, Tisha
 Dilley, Mary Ann
 Dines, Mrs. Eugene, Sr.
 Dings, McClelland G.
 Disbrow, Velma N.
 Diss, Mrs. Alexandra G.
 Division D - Civic Garden Club
 Dlugolecki, Leon
 The Dobbins Foundation
 Dobbins, Mr. & Mrs. Cris
 Dobbs, Mrs. Finis E.
 Dodge, Mr. & Mrs. Donald D.
 Dodge, Harry W., Jr.
 Doherty, Roger
 Dolan, Mrs. Joseph F.
 Dolmas, Betty
 Donsky, Marc A.
 Dorlan, Dorothy E.
 Dorn, Mrs. Clayton G.
 Dorn, Myrl G.
 Dorsey, Mrs. Montgomery
 Doty, Mrs. L.
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 Downing, Mr. & Mrs. George L.
 Downing, Mr. & Mrs. Mancourt
 Downing, Mrs. Mary Jane
 Downing, Mr. & Mrs. Richard, Jr.
 Dowst, Wayne
 Doyle, Mrs. Joe H.
 Drage, Charles M.
 Drager, Mrs. Kenneth
 Dragul, Mrs. Paul
 Dreher, Wenzel F. & Mildred Mary
 Dresen, Mary
 Drew, Mrs. Sandra
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 Dyer, Mrs. Jay
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 Eagleton, Mike

Eames, Mrs. Gladys G.
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 Eberle, Mr. & Mrs. William R.
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 Edison, Mrs. E. R.
 Edwards, H. M.
 Edwards, Mrs. James M.
 Edwards, Mrs. Page
 Edwards, Mr. & Mrs. William G.
 Egan, Dr. & Mrs. D. J.
 Egan, Mr. & Mrs. E. D.
 Egan, Mr. & Mrs. Tom
 Ehernberger, John E.
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 Eide, Richard N.
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 Eisenlohr, William S., Jr.
 Eisler, Ed
 Eisner, Edward F.
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 Eldridge, Geneva
 Ellett, Mrs. Emerson S.
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 Elliott, Miss Elmira
 Elliott, Mrs. Robert V.
 Ellis, Mrs. Catherine
 Ellis, Erl H.
 Ellis, George W.
 Elmore, Francis H.
 Elmquist, Fred N.
 Emerson, Mrs. Edgar
 Emery, Mrs. Philip W.
 Emmanuel, Dr. & Mrs. Sam I.
 Engard, Rose Ann
 Engard, Rosemary
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 English, Ron H.
 Enoch, Judge & Mrs. David W.
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 Ensor, Mary
 Epp, John G.
 Eppich, Mrs. Edward C.
 Eppler, Eugene
 Epstein, Mrs. Reva
 Erickson, Mrs. Carl G.
 Erickson, Carol
 Erickson, Eleanor R.
 Erickson, Miss Senja
 Erisman, Mrs. R. Franklin
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 Esmiol, Mr. & Mrs. Morris A.
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 Evans, Miss Edith M.
 *Evans, John
 Evans, Mr. & Mrs. John M.
 Evans, Miss Katherine
 Evans, Mrs. Richard F.
 Evans, Robert D.
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 Felzien, Larry
 Fender, Katherine A.
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 Fenton, Kathy
 Ferchan, Hugo A.
 *Ferguson, Carlisle
 Ferguson, Cynthia
 Ferguson, Mrs. David
 Ferguson, Mrs. John A.
 Ferguson, Louis
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 Fiori, Mrs. Robert F.
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 Fisher, Dr. & Mrs. Calvin
 Fisk, Mrs. Charles C.
 Fitch, Nancy J.
 Fitzgerald, Mr. & Mrs. Vincent
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 Flick, Mrs. Bruce
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 Ford, John J. & Loree
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 Foster, Mr. & Mrs. Paul J.
 Foust, Mildred A.
 Fouts, Mickey E.
 Fowler, Mrs. David A.
 Fowler, Mary F.
 Fox, Guy
 Francis, Mrs. Gretchen

Frankhouser, John R.
 Franklin, Mr. & Mrs. George
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 Frazier, Mr. & Mrs. John
 Freed, Dr. & Mrs. Charles G.
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 Freer, Mrs. Mary F.
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 Freilinger, Dianne D.
 French, Mr. & Mrs. John M.
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 Fry, Miss Florence E.
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 Fukuma, Mrs. George
 Fuller, Carolyn A.
 Fuller & Company
 Fuller, Mrs. John W.
 Fuller, Mr. & Mrs. Pierpont
 Furman, Shirley
 Futro, Stephanie

 Gale, W.
 Gallavan, Patrick J.
 Galmish, Mark
 Gambill, Mr. & Mrs. J. David
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 Garcia, Mrs. Olive
 Garcia, Sally
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 Gauss, Mrs. Elvia V.
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 Gibson, Mrs. Jess
 Giere, Marsha J.
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 Gillman, Lee & Linnea

Gilman, Dr. & Mrs. James I.
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 Glasscock, Dr. Thomas T.
 Glazer, Sylvia
 Glenn, Ann
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 Goldstein, Mary Ann
 Goldy, Mrs. H. Donald
 Golub, Dr. & Mrs. Burton P.
 Gonzales, Mrs. Yavonne
 Good, Mr. & Mrs. H. V.
 Goodstein, Dorothy Strear
 Goodwin, Sue
 Goodwine, Mrs. Aldena
 Gorce, Mr. & Mrs. Martin
 Gordon, Alice N.
 Gordon, Mrs. Charles P.
 Gorman, Mrs. William A.
 Gossert, Mr. & Mrs. Daniel J.
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 Gottschalk, Dr. & Mrs. Robert
 Gould, Mrs. G. H. B.
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 Graham, Robert S.
 Graham, Dr. & Mrs. William H.
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 Granata, Elaine
 Granicher, Mrs. Donald I.
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 Grant, Diane R.
 Grant, Mrs. E. H.
 Grant, Janet
 Grant, Mr. & Mrs. Newell
 Grant, Mrs. William W.
 Grant, Mrs. William W., III
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 Green, Mrs. Florence
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 Green Valley Turf Co.
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 Greiner, Gordon G.
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 Griffith, Mrs. Helen
 Griffith, Miss Mary C.
 Griffith, Mr. & Mrs. W. G.
 Grill, Leo F.
 Grimes, Mr. & Mrs. David
 Grimes, Mr. & Mrs. George L.
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 Griswold, Mrs. Lester E.
 Grogan, Mr. & Mrs. Ed

Gross, Mrs. Benjamin
 Grosshans, Mary Alice
 Grossman, Dr. & Mrs. John A.
 Grow, Dr. & Mrs. John B., Sr.
 Grow, Dr. John B., Jr.
 Guard, Dr. & Mrs. H. L.
 Guilfoyle, E. J.
 Gurian, Mr. & Mrs. Dan
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 Gurther, Mrs. A. S.
 Gutknecht, Brad

 Haberkorn, Betty L.
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 Hackstaff, Mrs. J. Edward
 Hackstaff, Ruth S.
 Hackstock, Mr. & Mrs. N. J.
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 Hafey, Pamela
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 Hagener, Lou W.
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 Haile, Mrs. J. K.
 Haines, Mrs. William M., Jr.
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 Haley, O. Ben, Jr.
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 Hall, Mrs. Laurence B.
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 Hamilton, Mrs. Frederic C.
 Hamilton, Helen M.
 Hammergren, Mary Ruth
 Hammond, Allison Astrid
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 Hanlon, R. J.
 Hannigan, R. S.
 Hanscom, Charles
 Hanselman, Mr. & Mrs. Richard W.
 Hansen, Mr. & Mrs. Claude B.
 Hansen, Howard R.
 Hansen, Louise M.
 Hanson, Mary Louise
 Hanson, Nancy R.
 Hanson, Virginia D.
 Hanson, Walter E.
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 Hargreaves, Col. R. B.
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 Harlan, Mrs. Homer S.
 Harley, Wynne
 Harper, Mrs. Fred
 Harr, Sally
 Harris, Mrs. J. A.
 Harris, Mr. & Mrs. J. Ramsay
 Harris, Mrs. Wilma C.
 Harrison, Mrs. Charles
 Harrison, Sydney P. & Lois K.
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 Harvey, Miss M. Carol
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 Hauck, Rachael
 Haug, Mr. & Mrs. Ken
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 Hawkins, Helen
 Hawkins, Mr. & Mrs. Horace N.
 Hawkins, Ruth
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 Haydon, Mrs. George W.
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 Hays, Mrs. George P.
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 *Hayward, Mrs. Phil
 Hazen, Mrs. Wayne C.
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 Hedges, C. F.
 Hegel, Mr. & Mrs. Fred W.
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 Heidenreich, Carl
 Heider, Walter E.
 Heins, Alison
 Heinz, David
 Heise, Howard A.
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 Heitzmann, R.
 Heller, Sandra
 Heller, Mr. & Mrs. Jeff C.
 Hemmingsen, Helen
 Henderson, Mrs. Clair G.
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 Henke, Charles F.
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 Herberger, Mr. & Mrs. John E.
 Herberger, Mr. & Mrs. Joseph T.
 Herbert, Mrs. Thomas G.
 Herfurth, Mr. & Mrs. Carl E.
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 Hermann, Dr. & Mrs. Gilbert
 Herold, Mr. & Mrs. Laurance
 Herring, Mrs. Carrie
 Herrington, Mrs. Cass M.
 Hershner, John D.
 Heslin, Mr. & Mrs. P.
 Hess, Alma Jean
 Hewett, Mrs. Ed
 Hewett, Eva M.
 Hewitt, Mrs. Edward R.
 Hiatt, Dr. D. C.
 Hicks, Mrs. S. Nelson
 Hieronymas, Mrs. R. E.
 Higbie, Mr. & Mrs. Harley G., Jr.
 Higgins, Mr. & Mrs. Gregory L.
 *Hildreth, Dr. A. C.
 Hill, Dorsey
 Homer Hill Gardens, Inc.
 Hill, Mr. & Mrs. O. A.
 Hill, W. J. and Karen
 Hilliard, Mrs. E. H., Jr.
 Hillyard, Mr. & Mrs. Gerald R.
 Hiner, Arthur W., Jr.
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 Hirschmann, Jan Victor
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 Hoagland, Mr. & Mrs. Edward C., III
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Hodges, Mrs. Joseph G.
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 Hoffer, John Howard
 Hoffman, Carol
 Hoffman, Florence
 Hoffman, Linda M.
 Hoffman, William
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 Hogsett, Mrs. V. H.
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 Hollendorfer, Fred & Cathy
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 Holmes, Mrs. Hardin
 Holmes, Joseph H.
 Holmes, Lelle M.
 Holmes, Richard W.
 Holt, Mr. & Mrs. Brian E.
 Holt, Jean M.
 Holt, M. B., Jr.
 Holtz, Esther A.
 Holyoke, Dr. John B.
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 Hopper, Mrs. Rosemary L.
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 Howe, Ray
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 Jacobs, Julie, Balaban, & Abby
 Jacobs, Sandra J.
 Jacobson, Mary E.
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 Johnson, Chester Harvey
 Johnson, Donald E.
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 Johnson, Sue
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 Johnston, Sue Ann
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 Kelley, Curtis & Nanette
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 Kirkpatrick, Mr. & Mrs. Alexander L.
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 Korpi, Barbara H.
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 Kramer, Susan E.
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 Kreissler, Jack
 Krenetsky, John C.
 Kretschmer, Mrs. Franz

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 Krista, Terry
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 Lambert, Mr. & Mrs. Lester J.
 Lamkin, Dr. Kenneth R.
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 Land, Mrs. Walter
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 Lange, Mrs. Wells
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 Larsen, Eileen A.
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 Lassich, Frank
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 Layton, Mr. & Mrs. Frank
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 Lederer, Dr. & Mrs. Robert L.
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 Lee, Mrs. C. Gordon
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 Levin, S. K.
 Levy, Mrs. Edward
 Levy, Jack H.
 Levy, Mrs. Samuel
 Lewin, Dr. Charles
 Lewis, David W., III
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 Lewis, Margaret
 Lewis, Mrs. Riva
 Liberacki, Mr. & Mrs. John
 Lichtwardt, Mr. & Mrs. E. J.
 Liggett, Mrs. Rosemary
 Light, Shirley J.
 Light, W. C.
 Lilly, Mrs. Alonzo
 Lilly, Mrs. John A.
 Lindberg, Mrs. David
 Lindahl, Mrs. S. O.
 Lindblom, William E.
 Linden, Dennis J.
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 Linger, Mr. & Mrs. James R.
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 Lirandais, Mr. & Mrs. Toni
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 Lister, Mrs. R. L.
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 Little, Judith Warren
 Litty, Laura F.
 Livingston, Mrs. Johnston R.
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 Lloyd, Mrs. Carl
 Lochrie, Stan & Pam
 Lockard, Mr. & Mrs. Robert L.
 Locketz, Barbara
 Lockridge, Mrs. John
 Loewecke, R. W. & Carol
 Lof, Mrs. Davadell
 Loffreda, Mrs. Philip
 Lofton, Leona Glee
 Logan, A. E.
 Loiseau, Mrs. Louis A.
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 Long, Mr. & Mrs. Everett C.
 Long, Mr. & Mrs. Lawrence A.
 *Long, Lucian M.
 Longcamp, Dr. John S.

Longley, Warren
 Longman, John B.
 Longpre, Dr. E. Keith
 Loose, Sharon
 Lornell, Randi
 Lortscher, Dr. & Mrs. Randall H.
 Howard Lorton, Inc.
 Lotito, Paul M.
 Love, Mrs. John A.
 Lucas, Mary V.
 Lucking, William H.
 Ludwig, James
 Luedke, Lucille
 Luelf, Lester
 Luetzelschwab, Wayne E.
 Luft, Mrs. Lois B.
 Lund, Dr. Lawrence O.
 Lunt, Mrs. John
 Luongo, Colonel & Mrs. H. L.
 Lupe, Mr. & Mrs. Robert D.
 Lutz, Mrs. John S.
 Lutze, Mrs. Donald
 Lyford, Mrs. Richard T., Jr.
 Lyons, Mrs. Donald H.

McAnulty, Dr. & Mrs. W. N., Jr.
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 McBrian, Mrs. Ray
 McCabe, Mr. & Mrs. Frank
 McCabe, Mr. & Mrs. John L.
 McCall, Ruth Scheihing
 McCammon, Mrs. R. F.
 McCarthy, J. W.
 McCarthy, Mrs. LaVeda
 McCarthy, Mrs. M. R.
 McClearn, Mrs. Hugh J.
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 McClintock, Mrs. Richard G.
 McClintock, Mrs. Robert
 McClure, Mrs. Carol J.
 McClure, Mr. & Mrs. George S.
 McCourt, Mrs. Purnee
 McCoy, Mr. & Mrs. James E.
 McCoy, Mrs. Richard
 McCulloch, Mr. & Mrs. Roderick D.
 McCutchan, Leah M.
 McDonald, Don & Alice
 McDonald, Mrs. Philip
 McDuff, Mr. & Mrs. S. Jack
 McElvain, Mr. & Mrs. H. Keith
 McFee, John G. or Patricia L.
 McGann, Brian & Family
 McGaughey, Mrs. R. B.
 McGee, Charles J.
 McGee, Mrs. Hugh
 McGinnis, Betty R.
 McGinnis, Mrs. Keith R.
 McGrath, Mr. & Mrs. Forrest E.
 McGraw, Mrs. H. D.
 McGuire, Dr. & Mrs. Carl
 McHugh, Mrs. Claire S.
 McHugh, Mr. & Mrs. Jerome
 McIntire, Barbara Z.
 McIntosh, Mr. & Mrs. James
 McIntosh, Syd
 McKee, Mrs. Edwin D.
 McKenna, Mrs. Robert
 McKercher, Mrs. Eugene A.
 McKerral, Mr. & Mrs. H. A.
 McKibben, Pat
 McKinney, Mr. & Mrs. Alexis
 McKinstry, Paky

McKnight, Mrs. John G.
 McKnight, Nancy E.
 McLaughlin, Carolyn
 McLaughlin, Mrs. James
 McLean, Barbara P.
 McLister, Mrs. Henry
 McMann, Mrs. J. Glenn
 McMichael, Mrs. Charlotte H.
 McMillen, Sophia A.
 McMurdo, Jean
 McNeley, Mary E.
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 McNichols, Mayor William H., Jr.
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 McWhinney, Mrs. Leroy

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 MacDonald, Mrs. Pamela
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 Macomber, Mrs. H. Hilliard
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 Manley, Duane
 Manning, Mrs. Robert
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 Marinoff, Mr. & Mrs. Oscar
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 Marks, Mr. & Mrs. Steven D.
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 Martin, Mrs. Bonnie
 Martin, David E.
 Martin, Mrs. Jane H.
 Martin, Mrs. Jessie
 Martino, Mrs. Paul R.
 Maslin, Dr. & Mrs. T. Paul
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 Mason, Mrs. Elvera H.
 Masoudi, Carol
 Mast, Geraldine
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 Mathis, Pamela L.
 Matthes, Mrs. David
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 Mattson, Mr. & Mrs. William R.
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 May, Sherre Lynn

May, Wayne H.
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 Mays, Mr. & Mrs. W. W.
 Maytag, Mrs. Jean P.
 Mayo, Ralph B.
 Meade, Mr. & Mrs. John N.
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 Meagher, F. Keith
 Meagher, M. Stewart
 Means, Kathleen S.
 Medford, Menton
 Meehan, Mrs. Bettie Lou
 Meehan, Dana
 Meehen, Mrs. H.
 Megrew, Alden F.
 Mellor, Mrs. C. C.
 Melnick, Herbert Jay
 Mendez, Mr. & Mrs. Bill
 Menter, Rorie
 Mentgen, Glen A.
 Mercer, Mrs. Gene
 Merrell, Mrs. Jessie T.
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 Metcalfe, Don R.
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 Meurer, Malcolm R.
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 Meyer, Cheryl
 Meyer, Dennis
 Meyer, Mr. & Mrs. Gene
 Meyer, Herbert F. R., Jr.
 Meyer, Miss Kay
 Meyer, Rochelle & Family
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 Mill, Mary H.
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 Miller, Betty W.
 Miller, David C.
 Miller, Frank
 Miller, Mrs. G.
 Miller, Mr. & Mrs. Joe K.
 Miller, Mrs. Kenneth W.
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 Miller, Mrs. Mott
 Miller, Mr. & Mrs. William D.
 Mills, Ernest P.
 Mills, James
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 Milroy, Peg
 Mimmack, Dr. Frederick W.
 Mimmack, Rufus F.
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 Mitchell, Irene
 Mitchell, Jeri
 Mitchell, Mr. & Mrs. John C.
 Mitchell, Mrs. Lenore
 Mitchell, Patricia M.
 Mitchell, Mrs. Samuel
 Mixa, Mrs. Edward
 Mobley, Beverley
 Moe, Dr. & Mrs. Paul
 Moehrke, Wilbert
 Mogielnicki, Nancy & Peter
 Mohr, Lawrence Q.

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 Mondy, Mr. & Mrs. Wayne
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 Monroe, Mrs. Helen E.
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 Moore, Millicent J.
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 Moore, Willard J., Sr.
 Moore, Mr. & Mrs. Willett S.
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 Morein, Norma
 *Morey, Mrs. Hugh C.
 Morgan, Cleon J.
 Morgan, Rex L.
 Morgridge, Dean L.
 Moritz, Chris
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 Morris, Mrs. Robert V.
 Morrison, Mrs. George R.
 *Morrison, Mr. & Mrs. Graham B.
 Morrison, Dr. & Mrs. John T.
 Morrison, Sadie
 Morroni, Mrs. A. J.
 Morrow, Warren F.
 Morse, Dr. Helvise G.
 Morse, Martha P.
 Motie, Margaret S.
 Mottern, Hugh H., Jr.
 Mounsey, Harriett L.
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 Mueller, Mr. & Mrs. Gilbert, Jr.
 Mugglestone, James F.
 Mueller, Helene
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 Mulford, Mrs. Warren E.
 Mullen, Mr. & Mrs. J. Charles
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 Munns, Faith
 Munns, Mrs. K. C.
 Munoz, Mr. & Mrs. Gaston
 Munoz, R. R.
 Munz, Mrs. Karoline F.
 Mumane, Mr. & Mrs. Leslie C.
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 Murphy, Michael P.
 Murphy, Steven R.
 Murray, Aneta B.
 Murray, Mr. & Mrs. William A.
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 Nagel, Margaret
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 Nawn, Mrs. Joanne
 Naylor, Kenneth D.
 Naylor, Mrs. Ray H.
 Neal, Mr. & Mrs. Jim
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 Negri, Richard
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 Nelson, Dean & Karen
 Nelson, Dee
 Nelson, Douglas
 Nelson, F. Walter & Dianne E.
 Nelson, Rauha M.
 Nelson, Ruth A.
 Nelson, Mrs. William E.
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 Neusteter, William H.
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 Newton, Mrs. Frances R.
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 Nichols, Mrs. Gayle
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 Nielsen, Larry D.
 Nix, Mrs. Helen
 Nixon, Mr. & Mrs. M. E.
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 Nolte, Jack
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 Nordquist, Mr. & Mrs. Ronald W.
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 Norgren, Mr. & Mrs. Leigh H.
 Norling, Kathy
 Normand, Mr. & Mrs. Phil
 Norris, Mrs. Donald C.
 Northen, Mrs. H. T.
 Nuzum, Wayne B.
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 Obermeier, Judith L.
 Obermeier, Victoria G.
 O'Brien, Jean V.
 Ockander, Mrs. Laurence
 Ockerman, Mr. & Mrs. H. L.
 O'Connell, Father John Q.
 O'Connor, Mr. & Mrs. Gene C.
 Odell, Mrs. William G.
 O'Donnell, Mrs. G. E.
 Ogawa, Mrs. Akira S.
 Ogilvie, Paula
 Ogura, Alice Y.
 Ohman, Margaret
 Okin, Danielle
 Oldaker, Mrs. M. J.

Oliver, Mrs. Robert E.
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 Olson, George N.
 Olson, Mrs. Ray F.
 Oman, Bruce
 O'Mara, Mrs. Thomas P.
 O'Neill, Miss Maryon
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 Oppegard, Mrs. C. R.
 Oppegard, Mrs. H. A.
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 Orleans, Peter
 Orth, Richard A.
 Orthman, Robert & Doris
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 O'Rourke, Mrs. Donald H., Jr.
 Ortloff, Mr. & Mrs. C. L.
 Ostrowski, Major L. A., Ret'd.
 Ostwald, Colleen A.
 Otto, Mr. & Mrs. Oscar O., Jr.
 Overholt, Merrill H.
 Overstreet, Mrs. G. L.
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 Owen, James C., Jr.
 Owen, Mrs. Thomas P.
 Owens, Mrs. Marvin F.
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 Padilla, John B.
 Page, Mr. & Mrs. Henry A.
 Palmer, Mr. & Mrs. J. Albert
 Palmer, Scott L.
 Palmer, Mrs. U. J.
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 Pannebaker, Frederic M.
 Pankey, Mrs. Robert W.
 Pankoski, Ed
 Papazian, Mrs. Harold A.
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 Pappas, Mrs. George
 Park, Mrs. David
 Parker, Mrs. C. O.
 Parker, Mr. & Mrs. Charles T., Jr.
 Parker, Zelma L.
 Parker, Mr. & Mrs. Dale
 Parks, Howard E.
 Pate, Nancy Lee
 Patience, Sister
 Patrick, Mr. & Mrs. Norman F.
 Patten, Dr. & Mrs. A. M.
 Patterson, Mrs. Joseph H.
 Patton, Mrs. William E., Jr.
 Paulino, Mrs. Mickey
 Paulson, Edna
 Paulson, Mr. & Mrs. Gary
 Pawley, Geraldine D.
 Payson, Mrs. E. C.
 Peacock, Dr. & Mrs. W. F.
 Peak, Mrs. Preston A.
 Pearson, Susan
 Peck, Christine E.
 Peck, Dr. & Mrs. Mordant E.
 Peckham, Mrs. John
 Pelletier, Mrs. Elaine A.
 Penix, Dr. Lex L.
 Penn, Ruth V.
 Perasso, Gary C.
 Perdew, Mrs. Ruth
 Perington, Mrs. A. L.

Perkins, Mrs. Dean A.
 Perkins, Fred J.
 Perlmutter, Mrs. Bruce
 Perlov, Dr. & Mrs. Alvin N.
 Perreten, Arnold E.
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 Pesman, Mrs. Elizabeth
 *Pesman, Gerard H.
 Peters, Mrs. Emily W.
 *Petersen, Mr. & Mrs. Charles
 Petersen, Dr. Gordon W.
 Petersen, Mrs. J. V.
 Petersen, Suzanne
 Peterson, Mr. & Mrs. Donald C.
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 Petty, Sue
 Petty, Mrs. Thomas L.
 Pew, Dr. & Mrs. David
 Peyton, Mrs. J. B.
 Pfaelzer, Mr. & Mrs. David
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 Phelps, Mr. & Mrs. William
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 Phillips, Mrs. Edith
 Phillips, Mr. & Mrs. Harry
 Phipps, Mr. & Mrs. Allan R.
 Phipps, Mr. & Mrs. Gerald H.
 *Phipps, Lawrence H., Jr.
 Pickens, Mrs. T. H.
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 Pike, Mrs. James
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 Plock, Susan
 Plummer, Mrs. Tim Alan
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 Pobuda, Mrs. Ursula
 Podolske, Emma
 Polak, Mrs. M.
 Polk, Mr. & Mrs. Leon A.
 Pollock, Dr. & Mrs. James D.
 Pooler, Dorothy H.
 Porter, Kenneth A.
 Post, Mr. & Mrs. Leonard
 Pote, Dr. & Mrs. Hugh L.
 The Potted Plant
 Prall, Nellie E.
 Prancan, Jane
 Price, Mrs. Max
 Price, Peggy A.
 Prine, Mr. & Mrs. Dale L.
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 Prugh, Mrs. Dane G.
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 Pulis, Mrs. Jay B., Jr.

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 Rae, Leona
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 Raitz, Mr. & Mrs. C. H.

Ramsey, Ken
 Ramsey, Paul
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 Rankin, Mrs. H. P.
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 Raskin, Arlene
 Rawles, Mrs. T. H.
 Raymond, Armand R.
 Rea, Mrs. Howard
 Reddien, Mr. & Mrs. Charles H.
 Redman, Norma D.
 Reed, Miss Helen F.
 Reed, Jack
 Reed, Mr. & Mrs. John Phillip
 Reeder, Ann
 Reeder, Robert & Roberta
 Reedy, Dennis & Jeanne
 Reedy, Lee J.
 Reese, M. Eileen
 Regan, Thomas J.
 Reller, Dr. & Mrs. L. Barth
 Rench, Mr. & Mrs. Stephen C.
 Rendi, Mrs. Renzo
 Renick, Mrs. Duane A.
 Reno, Mrs. Kyle Hicks
 Replogle, Elsie
 Reynolds, Dr. Howard C.
 Rhodes, Judith
 Riccardi, Capt. & Mrs. Frederic
 Rice, Mrs. Carroll A.
 Rich, Mrs. Sherman
 Richard, Frank
 Richards, Alberta V.
 Richards, Mrs. Edward
 Richards, Evelyn M.
 Richards, Mrs. Harlan R.
 Richards, Jeri
 Richardson, Mrs. Alfred B.
 Richardson, John G.
 Richardson, Robert D.
 Rickard, Mrs. Mary
 Rickards, Mr. & Mrs. Laurence
 Rickenbaugh, Mrs. Kent L.
 Rickenbaugh, Mrs. R. L.
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 Ricketts, Mr. & Mrs. Larry
 Ricketts, Richard M.
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 Riddoch, Martha Jones
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 Riggs, Mr. & Mrs. Richard B.
 Riggs, Rose Mary R.
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 Riley, Joseph O.
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 Roberts, Mrs. A. D.
 Roberts, Mrs. Ben
 Roberts, Bob
 Roberts, Mr. & Mrs. Brandt C.
 Roberts, Gregg C.
 Roberts, James
 Roberts, Kathy
 Roberts, Melvin J.

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Robertson, Mr. & Mrs. Campbell	Salzman, Mr. & Mrs. John D.	Shapiro, Sheila Ann
Robertson, Mrs. David	Sampson, John V.	Sharkey, Mrs. Edward
Robertson, Mrs. Donald	Sams, Mrs. Don E.	Shattuck, Mr. & Mrs. Warren
Robertson, Mr. & Mrs. Jack K.	Sandell, Mrs. Perry	Shaw, Mrs. Stuart
Robertson, Mrs. Orra M.	Sangster, Mrs. R. C.	Shaw, Mrs. William D.
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Robinson, Mrs. Arthur	Sargeant, Mrs. Raymond	Shearouse, Henry G., Jr.
Robinson, Delia A.	Sarver, Leslie & Barry	Sheetz, Mrs. Jeanne
Robinson, Mrs. F. George	Sassetti, Mr. & Mrs. Robert	Sheldon, Dr. & Mrs. Paul
Robinson, George J.	Satterlee, Robert R.	Shepherd, Mrs. Marjorie L.
Robinson, Mr. & Mrs. Harold W.	Sauck, L. C.	Shepardson, Mrs. John
Robinson, Mrs. Keith	Saunders, Mrs. Charles L.	Sherbok, Dr. & Mrs. Bernard C.
Robinson, Robert T.	Sauvage, Geraldine L.	Shere, Dr. & Mrs. Norbert
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Rogers, Mrs. Edmund B.	Schaetzel, Mr. & Mrs. Eugene J.	Shortt, Mrs. Fred
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Rogers, Mae Ellen	Schaller, Robert G.	Shults, Glynn
Rogers, Niall O.	Scheierman, Mrs. Kenneth	Sidwell, Mrs. William A., Jr.
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Roller, Lee	Schexnayder, M. F.	Sikes, Margaret
Rollinger, E. Alan	Schiesser, Carol	Silber, Mrs. Robert L.
Rollins, Mary	Schindele, Mrs. C. H.	Silver, Mr. & Mrs. Harold F.
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Roseboom, Mrs. Alex	Schlessman, Mrs. Gerald	Simmons, Mrs. Melvin
Rosen, Mr. & Mrs. H.	Schloss, Alva L.	Simmons, Virginia McConnell
Rosenbaum, Marc	Schmausser, Mrs. William	Simon, Mrs. Richard H.
Rosenberg, Mrs. H. Lee	Schmidt, Mrs. Roland	Simons, Mrs. Joan
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Ross, Mrs. W. Braxton	Schrepferman, Mrs. R. L.	Sinow, Mrs. Louis
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Rothenberg, Deborah	Schug, Mr. & Mrs. E. H.	Skinner, Susan
Rothman, Mrs. David	Schuloff Arborist Service	Skuderna, Mr. & Mrs. A. W.
Rothschild, Dr. & Mrs. Bertram	Schultz, Ms. Leola A.	Slack, Miss Enid W.
Rowe, Christine	Schultz, Mrs. L. H.	Slade, Mr. & Mrs. Russell S.
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Rudolf, John	Schwab, Mrs. W. D.	Sloan, Mrs. W. W.
Ruesch, Mrs. Walter G.	Schwartz, Mrs. Bruce L.	Slusher, Thomas
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Rumford, Mrs. Fred K.	Schwien, Mr. & Mrs. Nevin	Smead, Mr. & Mrs. Burton A., Jr.
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Rumsey, Mrs. James	Scott, Mrs. Leonora D.	Smith, Barbara A.
Russell, Mrs. William	Scovell, Mrs. Philip	Smith, Mrs. Carl L.
Russell, Mr. & Mrs. William C., Jr.	Scribner, Curtis L.	Smith, Mrs. Constance W.
Rutledge, Dr. Enid K.	Seacat, Mr. & Mrs. R. R.	Smith, Donna Marie
Rutter, Robert L.	Secore, Mikel	Smith, Mrs. Dudley
Rydstrom, Mrs. Arthur G.	*Secrest, Mrs. Mary	Smith, Mr. & Mrs. Ernest M.
Rydstrom, Mrs. Donald	Seifert, Mr. & Mrs. Arthur J.	Smith, Greg
Rymer, Dr. & Mrs. Charles A.	Seiler, Martha A.	Smith, Dr. Jerry
Rymers, John A.	Seitz, Mrs. Susan W.	Smith, Mrs. John D.
Rynders, Miss Constance June	Seligmann, Mrs. Harriet	Smith, Mrs. John P.
	Sellers, Dr. & Mrs. Dilworth P.	Smith, Jonel L.
	Sensenig, Mrs. John A.	Smith, Mrs. L. Darby
Sabbatino, Mrs. Genevieve	Serrell, Mrs. Edward W., Jr.	Smith, Mrs. Lucy
Sadler, Sheryl K.	Serrell, Helen H.	Smith, Lynn
Safford, Mrs. Edward	Sewall, Mr. & Mrs. Joseph S.	Smith, Margaret C.
Sakayama, Ronald J.	Sexton, John R.	Smith, Mrs. Marie L.
Saks, Nina	Shaffer, Mrs. H. D.	Smith, Mr. & Mrs. Newbery
Salgado, Mrs. Joan	Shafroth, Mr. & Mrs. Frank H.	Smith, Mr. & Mrs. Randall S.
Salsbury, Mrs. M. H.	Shames, Deborah	Smith, Mr. & Mrs. Raymond W.
Salter, Mr. & Mrs. W. Dean	Shankle, Mrs. T. E.	Smith, Dr. & Mrs. Stuart W.
Salyards, Miss Susan		

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 Snapp, Mrs. Don M.
 Snare, Mr. & Mrs. William D.
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 Snyder, Margaret R.
 Snyder, Mildred O.
 Snyder, Sandra W.
 Snyder, Mr. & Mrs. Willard S.
 Solawetz, Lois J.
 Sollars, Mr. & Mrs. P. F.
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 Sommer, Mrs. John M.
 Soos, Mrs. John S.
 Soronen, Arthur
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 Staack, Mary M.
 Stackpole, Mrs. Bucky
 Stahl, Mrs. Donald
 Staley, Ron
 Stange, Mrs. Ronald R.
 Stanki, Michael
 Stanley, Mrs. Helen D.
 Stanley, Mrs. William
 Stanwood, Mrs. Jonathan R.
 Starr, Suzanne Marie
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